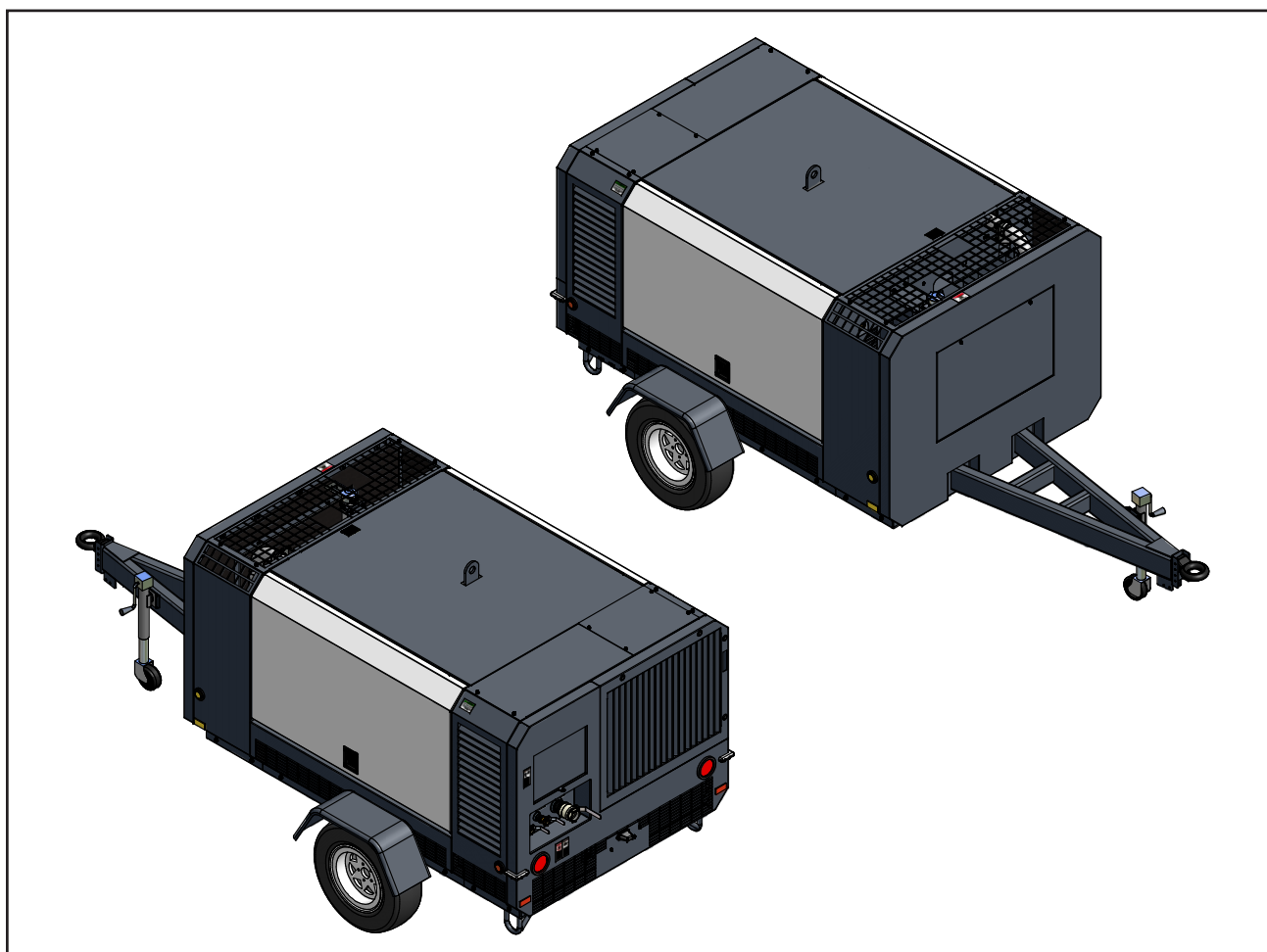




# Service and Maintenance Manual

## LR 450 Portable Air Compressor



This manual must be read carefully before using your MMD Equipment Compressor. Store in a safe and convenient location for future reference.

For technical support:

Phone: (800) 433-1382 (Outside USA)

Email: [nick.luciano@mmdequipment.com](mailto:nick.luciano@mmdequipment.com)

Website: [www.mmdequipment.com](http://www.mmdequipment.com)



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## Manual Change History

## 1.1 Revision List

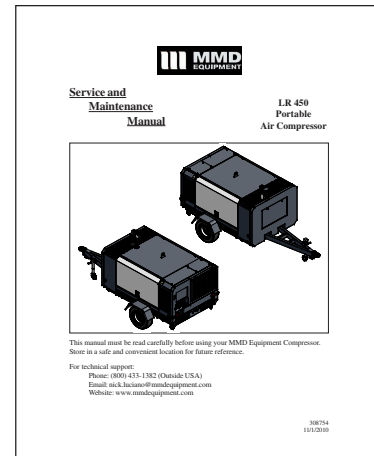
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# Welcome

## 2.1 General Information

Thank you for choosing the LR 450 Portable Compressor. Before operating this system, read over this manual and become well acquainted with your new machine. Doing this will increase your safety and maximize the life of the machine.

While this manual is written to be as accurate as possible, MMD equipment strives to continually improve the efficiency and performance of its machines. As a result, sometimes there may be slight differences between a given version of the manual and the machine.

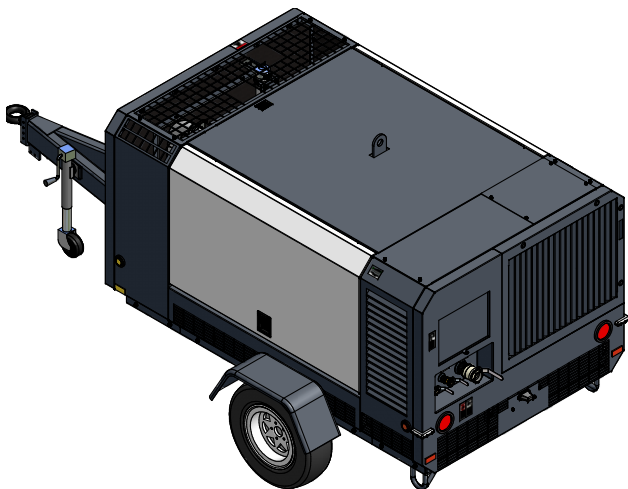


## 2.2 Overview

The LR 450 Portable Compressor is a strategically designed system. It integrates all major components on a single, environmentally sealed frame, which is enclosed in a tough, weather-resistant canopy.

The LR 450's rotary screw design guarantees continuous air output of up to 450 SCFM (standard cubic feet per minute) at 100 PSI (pounds per square inch). With remote fluid drains and hinged doors, virtually all components are accessible for maintenance and service. Instrumentation clearly displays

pressures, temperatures, RPM, and hours of operation. Other features, including a spin-on compressor oil filter and a drop-in separator element, reduce the time and costs associated with routine maintenance.



The LR 450 also has enhanced safety features to protect your valuable resources: minimum pressure valve, high compressor oil temperature shutdown, high discharge pressure shutdown, automatic blowdown device, pressure relief valve, and clearly displayed warning/information decals.

# Safety

## 3.1 General Safety Overview

Remember, safety is basically common sense. While there are standard safety rules, each situation has its own peculiarities that cannot always be covered by rules. Therefore with your experience and common sense, you are in a position to ensure the safety of yourself and others. Lack of attention to safety can result in: accidents, personal injury, reduction in efficiency, and worst of all – Loss of Life. Watch for safety hazards and correct them promptly.

Understanding the proper operation of this equipment is critical to its safe operation. The owner, lessor, and/or operator of this equipment is hereby notified and forewarned that any failure to observe the safety and operating guidelines may result in injury and/or damage. MMD Equipment expressly disclaims responsibility or liability for any injury or damage caused by failure to observe these specified precautions or by failure to exercise the ordinary caution and due care required while operating or handling this equipment, even though not expressly specified.

In addition to following these safety guidelines, the operator should follow any company specific guidelines and procedures. Consult your immediate supervisor for specific company safety guidelines and/or procedures.

The following safety symbols are used throughout this manual to draw attention to important information. If the information is not carefully read and the instructions are not followed, severe injury, death, and/or damage to property and equipment may occur.



Indicate[s] an imminently hazardous situation, which, if not avoided, **will** result in death or serious injury.



Indicate[s] a potentially hazardous situation, which, if not avoided, **could** result in death or serious injury.



Indicate[s] a potentially hazardous situation, which, if not avoided, **could** result in minor or moderate injury.



Indicate[s] a potentially unsafe situation or practice, which, if not avoided, can result in property and/or equipment damage only.

# Safety

## 3.2 Safety Precautions

The following safety precautions are a general guide to safe operation of the equipment.



**! DANGER**

This is a pressurized system. Do not attempt to remove any part of this machine without first completely relieving entire system of pressure. Do not attempt to service any part of the equipment while in operation. Never attempt to repair or modify any pressure vessel or device.



**! DANGER**

System contains hot oil. The system must be shut off prior to servicing. Then permit system to cool down prior to adding compressor oil or servicing the unit.



**! DANGER**

Do not use air from this system for breathing or food processing. Air from this system will cause severe injury or death if used for breathing or food processing.



**! DANGER**

The system is designed to compress air. Do not attempt to compress other gases. Compression of other gases may create a situation where an explosion or fire may occur.



**! DANGER**

Do not use flammable solvents for cleaning system components as this can cause the unit to ignite or explode during operation. Keep combustibles out of and away from system inlets and any associated enclosures.

**! DANGER**

Never disable, override, or remove safeties, either temporarily or permanently.

**! DANGER**

Do not modify systems to operate equipment at a higher or lower pressure than specified.

# Safety

## 3.2 Safety Precautions (continued)



Read and understand this manual and all other safety instructions before using this equipment. Failure to follow operating instructions and/or failure to follow maintenance procedures and intervals could result in personal injury, death, and/or damage to equipment and property.



Use only MMD Equipment approved replacement parts.



Never place machine on a grade more than 15 degrees.



Never operate the machine in an enclosed area.



Keep doors closed on the machine during operation.



Check engine's operator manual for required service and maintenance intervals.



Never tow trailer unless all electrical lights are connected and working properly.

# Safety

## 3.3 Safety and Information Decals

This machine is supplied with a full complement of safety and identification decals. These decals are affixed to the unit during final assembly. These decals must be clearly visible and undamaged. Should any of these decals become illegible or damaged, immediately replace the decal.



Hot Exhaust



Pressurized System



Fan Guard



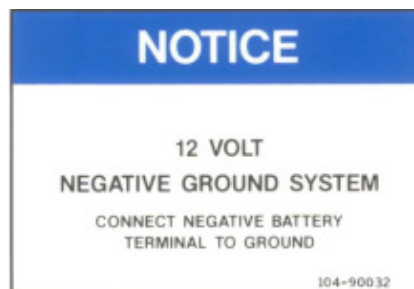
Hot Pressurized Oil



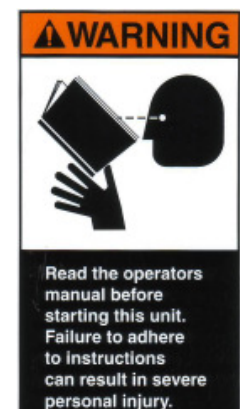
Electrical Shock



Hot Coolant



Negative Ground System

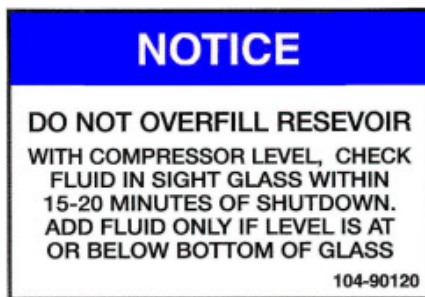


Read Manual



# Safety

## 3.3 Safety and Information Decals (continued)



Overfill



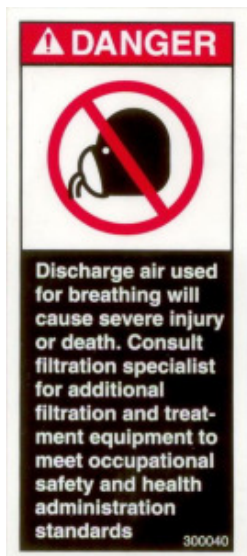
Towing



Compressor Oil



Do Not Lift



Breathing Air



Connect Hose



Pinch Point

# Safety

## 3.3 Safety and Information Decals (continued)

STARTUP PROCEDURE

Startup Preparation

1. Close all service valves.

2. Verify fluid levels and refill if necessary.

3. Check battery cables and connections for corrosion.

4. Check condition of fan belt.

5. Check all hose connections for leaks.

6. Press the "AUTO" button on the control panel and check for warnings or error codes.

Startup Procedure

1. Press the "RUN" button on the control panel to begin the startup sequence.

Note: The machine will cycle through a preheat, cranking, and warmup period. This will last approximately three minutes. Machine is ready for use when system pressure reaches 100 psi.

2. Open service valves to begin using air.

SHUTDOWN PROCEDURE

Routine Shutdown Procedure

1. Close all service valves.

2. Press the "OFF" button on the control panel. The control panel will ask to start cool down sequence.

3. Press the "ENTER" button on the control panel to start the cool down sequence. The engine will run through a cool down sequence that will last three minutes.

WARNING: DO NOT press the "OFF" button two times consecutively or during the cool down sequence! This will bypass the cool down sequence. Bypassing the cool down sequence will cause excessive wear on the drive coupling. Damage to the drive coupling due to improper shutdown WILL void the drive coupling warranty.

308804

EMERGENCY SHUTDOWN PROCEDURE

The Emergency Stop Button is to be used in situations where danger is eminent! Using the emergency stop button for standard shut down WILL cause excessive wear on the drive coupling. Damage to the drive coupling due to improper shut down will void the drive coupling warranty.

Emergency Shutdown Procedure

1. Press the Emergency Stop Button on the control panel.

2. Correct source of emergency situation prior to operating this machine again.

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## Emergency Shutdown Procedure

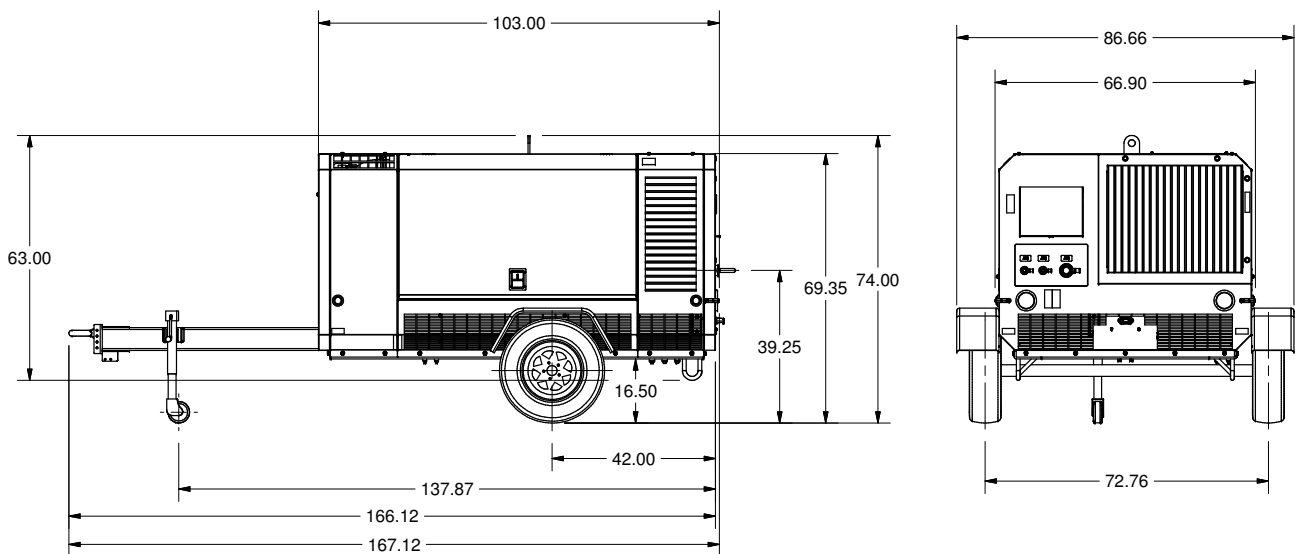
## Start-up/Shutdown Procedure

# Specifications

## 4.1 Specification Sheet

<b>Air Delivery @ 100 PSI</b>	CFM	464
<b>Engine Speed</b>	RPM	2500
<b>Engine</b>	Isuzu 3.0L 4CYL Turbo Diesel	
<b>Engine Fuel Specification</b>	Low Sulfur Diesel	
<b>Compressor Airend</b>	SCA20G with 1.20 Gear Ratio	
<b>Compressor Oil Capacity</b>	13 Gallons	
<b>Electrical System</b>	12 VDC	
<b>Machine Weight</b>	5800 lbs (Wet)	
<b>Overall Dimensions</b>	167" L x 63" H x 87" W	
<b>Duty Cycle</b>	Continuous Duty	
<b>Machine Operating Angle</b>	15° maximum	
<b>Ambient Conditions</b>	-40°F to 115°F	

**\*SPECIFICATIONS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE\***



# Description of Components

## 5.1 Engine

The LR 450 contains an Isuzu 4 cylinder diesel engine. This engine has been specially modified to handle the rugged duty required for its operation. This engine is setup to run on low sulfur diesel fuel. The engine speed is regulated electronically by the machine controller.

## 5.2 Drive Coupling

Power from the engine is transmitted to the compressor input shaft through a specially designed drive coupling. The drive coupling consists of a highly torsionally flexible rubber disc that mates with an engine flywheel flange. The coupling provides a torque limitation to protect from system overloads.

## 5.3 Compressor Airend

The LR 450 airend is a positive displacement, oil flooded, rotary screw type unit employing one stage of compression to achieve the desired pressure. Components include a housing (stator), two screws (rotors), bearings, and bearing supports. Power from the engine flywheel is transferred through a gear set to the male rotor. The female rotor is driven by the male rotor. There are five lobes on the male rotor while the female rotor has six roots. In operation, two helical grooved rotors mesh to compress air. Inlet air is trapped as the male lobes roll down the female grooves, pushing trapped air along, compressing it until it reaches the discharge port at the end of the stator and delivers smooth-flowing, pulse-free air. Being an oil flooded system, the oil serves three purposes: lubricates the rotating parts and bearings, serves as a cooling agent for the compressed air, and seals the running clearances.

## 5.4 Separator System

### I. Separator Tank

From the compressor airend, the compressed air and hot oil flow into a steel, ASME coded, pressure vessel, rated at 250 PSI, that acts as an oil reservoir. This tank is the first of two stages in separating the oil and compressed gas mixture. From the bottom of the separator tank, oil is forced to the oil filter.

### II. Separator Element

At the top of the separator tank is the separator element. The separator element removes the oil mist from the air as it is passed on to the minimum pressure valve. As the air/oil mist passes through the outside of the media, oil gathers on the interior walls and settles to the bottom of the element. Collected oil is returned to the compressor airend through the oil return line. The separator will filter the oil concentration in the air to less than 3 parts per million.

## 5.5 Pressure Relief Valve

### I. Separator Tank Relief Valve

This valve vents separator tank pressure to atmosphere should the pressure inside the tank exceed 175 PSI.

# Description of Components

## 5.6 Fuel Tanks

The LR 450 fuel system consists of two 24 gallon fuel tanks. The primary fuel tank is located on the curb side of the machine. The auxiliary fuel tank is located on the road side of the machine. The fuel tanks are joined together to function as one 48 gallon fuel tank. Both tanks can be filled from either fuel tank. Use only low sulfur diesel when fueling this machine.

## 5.7 Engine Air Filter

The engine air filter is a two stage, dry type intake filter with a gravity evacuator and replaceable internal element. On the outlet of the engine air filter is an air filter restriction indicator. This indicator serves as a maintenance tool. A “check filters” warning will display on the control panel when the filter need to be serviced.

## 5.8 Cooling Systems

### I. Engine Radiator

The radiator is designed to dissipate the heat load of the engine and is mounted in front of the specially selected engine fan. Hot engine coolant is passed through the interior of the radiator and heat is transferred to the air that passes across the cooling fins.

### II. Engine Charged Air Cooler

The charged air cooler is designed to cool the engine intake air after it passes through a turbo-charger but before the air enters the engine. Cooling the air before entering the engine will optimise the power for the combustion process.

### III. Compressor Oil Cooler

The compressor oil cooler is designed to dissipate the heat created during the compression of air. The oil cooler is mounted adjacent to the engine radiator. This works similar to the engine radiator but is designed to withstand the full compressor system working pressure.

## 5.9 Compressor Inlet Valve

The compressor inlet valve is a normally open air intake valve bolted to the compressor airend. When the system is shut down, this valve also acts as a check valve that prevents the air/oil mixture within the compressor airend from entering the inlet tubing.

## 5.10 Compressor Oil Filter

The compressor oil filter is a full flow, spin-on canister. It has been specially designed to handle the full system pressure. The oil filter is mounted downstream of the separator tank to ensure all contaminants are prevented from being passed on to the compressor oil cooler. An oil filter restriction indicator is located on the oil filter head. This indicator serves as a maintenance tool. A “check filters” warning will display on the control panel when the filter needs to be serviced.

# Description of Components

## 5.11 Compressor Oil Thermal Valve

The compressor oil thermal valve is a thermostatically controlled bypass valve that allows varying amounts of oil, depending upon the temperature, to bypass the oil cooler. The oil thermal valve directs oil flow back to the compressor airend until the system reaches 180°F. Once at system operating temperature, the valve shifts directing the flow through the oil cooler before returning to the compressor airend.

## 5.12 Minimum Pressure Valve

To ensure there is adequate pressure to produce proper oil flow throughout the system, a spring loaded, normally closed minimum pressure valve is set to maintain at least 50 PSI in the separator tank.

## 5.13 Blowdown Valve

The blowdown valve is a shuttle valve that vents system pressure to atmosphere when the system is shut down. This is done to prevent the high torque load that would be required to overcome the static pressure. The blowdown valve is stamped with an “I” and a “P”. The “I” side is connected to dry air from the separator tank, and the “P” side is the pilot signal coming from the compressor inlet valve.

## 5.14 Manual Load/Unload Valve

This turn valve is used to limit the compressor system pressure. When the valve is in the closed position, the system will build to the regulator setting. If the valve is in the open position, the system will build to approximately 45 PSI.

## 5.15 Discharge Pressure Regulator Valve

This valve, located downstream of the separator element, is used to set the desired discharge pressure. This valve will send a pneumatic signal to the inlet valve to start closing when the pressure exceeds the set-point. This signal will also adjust the speed of the engine. This system has a maximum operating pressure of 100 PSI and a standby pressure of 130 PSI.

## 5.16 Digital Control Panel

The LR 450 incorporates a digital control panel that monitors and records numerous parameters.

### I. Engine Oil Pressure Parameter

This feature displays the oil pressure inside the engine block. When the pressure drops below 20 PSI, a warning will display on the control panel. The system will shut down when the engine oil pressure drops below 15 PSI.

# Description of Components

## 5.16 Digital Control Panel (continued)

### II. Engine Coolant Temperature Parameter

This feature displays the temperature of the engine coolant. If the temperature reaches 200°F, a warning will display on the control panel. The system will shut down if the temperature reaches 220°F.

### III. Compressor Discharge Pressure Parameter

This feature displays a failure if the system pressure of the air compressor exceeds 150 PSI. If the pressure reaches 150 PSI, the system will shut down.

### IV. Compressor Discharge Temperature Parameter

This feature displays a failure if the compressor discharge temperature exceeds 240°F. If the temperature reaches 240°F, the system will shut down.

### VI. Hourmeter

The hourmeter records the total number of operating hours. It serves as a guide in following the recommended maintenance schedule. The hourmeter will only run when the engine is operating.

### VII. Tachometer

This feature displays the speed of the engine. If the speed of the engine reaches 2600 RPM or drops below 1400 RPM, a warning will display on the controller. If the speed of the engine reaches 2700 RPM or drops below 1300 RPM, the system will shut down.

### VIII. Fuel Level

This feature displays the percentage of fuel in the fuel tanks. When the fuel level is at 15%, a warning will display on the control panel. The system will shut down when the fuel level is at 0%.

### IX. Battery

This feature displays the voltage level of the battery. If the voltage is at 11.5 volts, a warning will display on the control panel. The system will shut down if the voltage reaches 7.6 volts.

## 5.17 Gauges

The LR 450 is also equipped with two analog gauges. A compressor discharge pressure gauge and fuel level gauge.

## 5.18 Emergency Stop Button

In the case of a dangerous situation, the LR 450 is equipped with an emergency stop button. The emergency stop button is to only be used when imminent danger is present. Using the emergency stop button for standard shutdown WILL cause excessive wear on the drive coupling of the system. Damage to the drive coupling due to improper shut down WILL void the warranty for the drive coupling.

# Description of Components

## 5.19 A-Frame Drawbar and Hitch

The A-frame drawbar and hitch connects the towing vehicle and the machine. This drawbar has been designed to handle the rugged duty required for its operation.

## 5.20 Running Gear

Axle, wheel, and tires are all sized for their job. This machine is equipped with a single axle. The design of the machine, plus the axle design, makes towing at highway speed possible.

## 5.21 Safety Chains

Safety chains should be attached on opposite sides of the machine's drawbar and crossed under the drawbar when passed forward to the towing vehicle so as to cradle the drawbar in the event of a breakaway. Slack should be sufficient to permit full turns.

## 5.22 Breakaway Switch

The cable for the breakaway switch should be attached to the towing hitch of the vehicle being used to tow the compressor. In the event of a breakaway the trailer breaks will engage, stopping the trailer immediately.



# Installation

## 6.1 System Installation Overview

The LR 450 should be installed only by those who have been delegated to do so, trained, and who have read and understand this manual. Failure to follow the instructions, procedures, and safety precautions in this manual may result in accidents and injuries.

Install, use, and operate this system only in full compliance with all pertinent O.S.H.A., Federal, State, and Local codes or requirements, in addition to MMD Equipment and any company's regulations.

Do not modify this system except with written factory approval.

## 6.2 Towing The Machine

- I. Carefully inspect the machine's ball hitch, drawbar, and chains look for excessive wear, corrosion, cracked, bent, dented, or otherwise deformed or degraded member, loose nuts, bolts, or other fasteners. Do the same on the towing vehicle's hitch and related hardware. If inspection shows any worn or damaged parts, **DO NOT TOW** the machine until repairs are made.



### **Torque Specifications:**

**Hitch fasteners: 150 ft-lbs.**

**Wheel lug fasteners: 90 - 120 ft-lbs.**

**Safety chain fasteners: 50 ft-lbs.**

- II. Chock or block the machine's wheels and raise the drawbar to the approximate level of the towing vehicle hitch.
- III. Engage, close, and lock the coupling device.
- IV. Attach safety chains.
- V. Attach electrical connection.
- VI. Attach breakaway switch.
- VII. Fully retract front screw jack. Place any retractable stand in a full up and locked position with the stand horizontal.
- VIII. Carefully inspect the tires and check the tire pressure.
- IX. Test all running, tail, stop, and directional lights. Make sure that all lights and reflecting surfaces are clean and in good condition.
- X. Close and latch the doors and access panels.
- XI. Set the parking brake in the towing vehicle. Only then remove chocks or blocks from machine wheels.

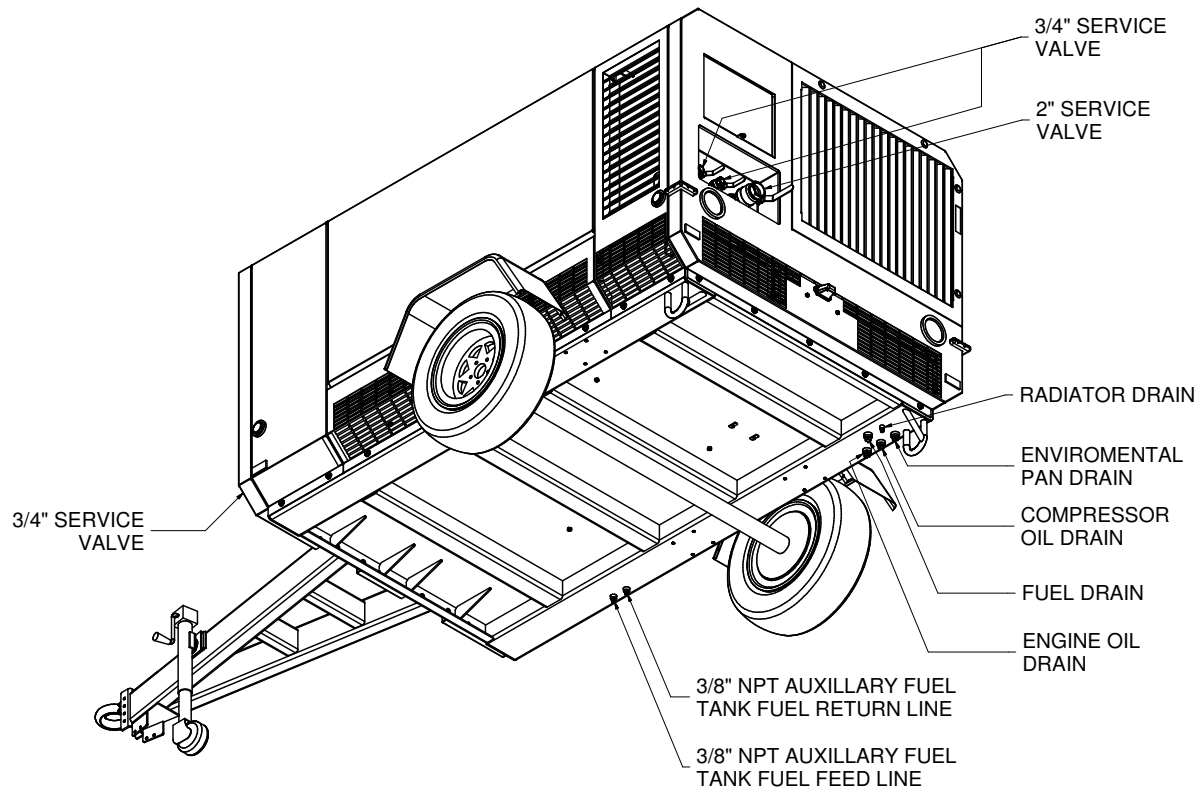
## 6.3 Parking The Machine

- I. Chock or block the wheels.
- II. Disconnect the electrical connection.
- III. Disconnect the safety chains and wrap them around the drawbar.
- IV. Lower front jack to raise machine off the towing vehicle's hitch.
- V. Move the towing vehicle clear of the machine.

# Installation

## 6.4 Placing The Machine

The first step to installing the LR 450 is parking the system on a solid, level surface. This machine is designed to run at a 15° grade maximum. If you must park on any grade, park across the grade so that the machine does not tend to roll. The machine must be supplied ample ambient air, as the system will overheat if the cooling air intake's temperature exceeds ambient conditions.



## 6.5 Service Valves

The LR 450 is equipped with four service valves. A 2" NPT service valve and two 3/4" NPT service valves are located in the rear of the machine underneath the control panel. Located in the front of the machine is a remote 3/4" NPT service valve.

## 6.6 Remote Drain Ports

The engine oil, radiator, compressor oil, fuel, and environmental pan drains are all located behind the curbside tire underneath the machine. Remove the 3/4" NPT plugs, 1/4" for the radiator, to drain the fluids from the machine. The engine oil and the compressor oil drains utilize a ball valve to control the oil flow. These valves are located next to the battery on the curb side of the machine.

## 6.7 Auxillary Fuel Tank

Use the two 3/8" NPT ports located in front of the curbside tire, underneath the machine, to connect an auxiliary fuel tank. Connect the fuel return line to the port closest to the tire. Connect the fuel feed line to the remaining port.

# Installation

## 6.8 Pre-Startup Inspection

This inspection must be done prior to initial system startup.

- I. Check all assemblies, clamps, fittings, hose connections, nuts, and bolts to ensure they are properly tied and secured.
- II. Remove all tools, rags, and installation equipment from the area.
- III. Check all valves to ensure they are in the correct operating position.
  - A. Engine Oil Drain Valve = Closed
  - B. Compressor Oil Drain Valve = Closed
  - C. Manual Cold Start Valve = Closed

## 6.9 Machine Documentation

Record serial numbers for main components in the system.

- I. Machine Serial Number \_\_\_\_\_
- II. Compressor Airend Serial Number \_\_\_\_\_
- III. Engine Serial Number \_\_\_\_\_
- IV. Separator Tank Serial Number \_\_\_\_\_
- V. Digital Control Panel Serial Number \_\_\_\_\_

## 6.10 Check Fluid Levels

The machine is factory filled prior to shipment. The proper fluid levels are also listed in the maintenance section.

- I. Separator Tank Oil Level = Halfway on the separator tank sightglass.
- II. Engine Radiator Coolant Level = Bottom of the radiator fill neck.
- III. Engine Coolant Recovery Bottle = Fill to the cold line.
- IV. Engine Oil Level = Full on the dipstick.

# Installation

## 6.11 Initial Start-up Preparation

- I. Reconnect battery terminals. Ensure the red cable is connected to the battery's positive terminal, and the black cable is connected to the battery's negative terminal.
- II. Verify fluid levels and refill if necessary.
- III. Verify all electrical connections are secure.
- IV. Check all hose connections for leaks.
- V. Close all service valves.

## 6.12 Initial Startup

At this point the system is ready to test for functionality. Be sure to complete all of the previous steps prior to continuing.

- I. Press the "AUTO" button on the controller.
- II. Check the controller for warnings or error codes.
- III. Press the "RUN" button on the controller to begin the startup sequence. The machine will cycle through a preheat, cranking, and warm-up period. This will last approximately three minutes. After the warm-up period is complete the compressor will switch to high speed of 2500 RPM for approximately 30 seconds then will return to a low speed of 1800 RPM.
- IV. Check system for leaks.
- V. Allow system to run until engine coolant temperature reaches 190°F.
- VI. Check for leaks again.
- VII. Open service valves to verify engine speed increases to 2500 RPM.
- VIII. Close service valves.
- IX. Press the "OFF" button on the control panel. The control panel will ask to start the cooldown sequence.
- X. Press the "ENTER" button on the control panel. This will start the cooldown sequence. The cooldown sequence will last approximately three minutes.

**DO NOT press the "OFF" button two times consecutively or during the cooldown sequence.**



**This will bypass the cooldown sequence. Bypassing the cooldown sequence will cause excessive wear on the drive coupling. Damage to the drive coupling due to improper shut down WILL void the drive coupling warranty.**

- XI. Verify all fluid levels and refill if necessary.
- XII. Initial Startup testing is complete.

# Operation

## 7.1 Routine Operating Procedures

The LR 450 should only be operated by those who have been delegated to do so, trained, and who have read and understand this manual. Failure to follow the instructions, procedures, and safety precautions in this manual may result in accidents and injuries.

Operate this system only in full compliance with all pertinent O.S.H.A., Federal, State, and Local codes or requirements, in addition to MMD Equipment and any company's regulations.

The LR 450 utilizes a specially designed system controller that electronically controls all aspects of the compressor's operation. Follow the instructions carefully. Improper use of the control panel will cause damage to the drive coupling. Damage to the drive coupling due to improper use will void the warranty.

### I. Routine Start-up Preparation

- A. Verify service valves are closed.
- B. Verify fluid levels and refill if necessary.
- C. Check battery cable connections for corrosion.
- D. Check the condition of the engine fan belt.
- E. Check for fuel, oil, and/or coolant leaks.
- F. Press the "AUTO" button on the control panel and check for warnings or error codes.

### II. Routine Start-up Procedure

- A. Press the "RUN" button on the control panel to begin the start up sequence.

## NOTICE

The machine will cycle through a preheat, cranking, and warm-up period. This will last approximately three minutes. Machine is ready for use when the system pressure reaches 100 PSI.

- B. Open the service valves to begin using air.

# Operation

## 7.1 Routine Operating Procedures (continued)

### III. Routine Shutdown Procedure

- A. Close all service valves.
- B. Press the “OFF” button on the control panel. The control panel will display “COOLDOWN?” as a question to start the cooldown sequence.
- C. Press the “ENTER” button on the control panel to start the cooldown sequence. The engine will run through a cooldown sequence that will last approximately three minutes.

The purpose of the cooldown sequence is to properly decrease system pressure before shutdown. To protect the drive coupling from damage, the system pressure must be below 50 PSI before the machine shuts down.



**DO NOT press the “OFF” button two times consecutively or during the cooldown sequence.**

**This will bypass the cooldown sequence.**

**Bypassing the cooldown sequence will cause excessive wear on the drive coupling. Damage to the drive coupling due to improper shut down WILL void the drive coupling warranty.**

## 7.2 Emergency Stop Procedure

In the event of an emergency and the LR 450 must be stopped suddenly, the machine is equipped with an Emergency Stop switch. This should only be used in the case of an emergency. This should not be used as a routine shutdown device. Using the emergency stop button for standard shutdown WILL cause excessive wear on the drive coupling. Damage to the drive coupling due to improper shutdown will void the drive coupling warranty. If the emergency stop button must be used, do not operate this machine until the problem has been resolved.

### I. Emergency Shutdown Procedure

- A. Press the Emergency Stop button on the control panel.
- B. Reset Emergency Stop button.
- C. Correct source of emergency situation prior to operating this machine again.

# Maintenance

## 8.1 Maintenance Overview

This section contains instructions for performing the inspection, lubrication, and maintenance procedures required to ensure the system is in proper operating condition. The importance of performing the maintenance described herein cannot be over emphasized. A planned program of periodic inspection and maintenance will help avoid premature failure and costly repairs. Keep an accurate logbook for maintenance, service, and operating hours. The maintenance schedule intervals on this system are maximum intervals. The factory recommended maintenance schedule is based on favorable operating conditions. For continuous duty, extreme temperature, etc., service more frequently. Neglecting routine maintenance can result in machine failure or permanent damage.

This system should be maintained only by those who have been delegated to do so, trained, and who have read and understand this manual. Failure to follow the instructions, procedures, and safety precautions in this manual may result in accidents and injuries.

## 8.2 Maintenance Schedule

INTERVAL	DESCRIPTION
EVERY 10 HOURS OR DAILY	1. Check separator tank oil level.
	2. Check engine coolant level in coolant bottle.
	3. Check control panel for filter warnings
	4. Check for fuel, oil, air, and coolant leaks.
	5. Check battery hold down for security.
EVERY 50 HOURS OR WEEKLY	1. Drain liquid from separator tank. More frequent draining may be required under high humidity conditions.
	2. Inspect lifting frame.
	3. Check drawbar and two hitch bolts torque (and prior to each move). 70 ft-lbs
	4. Check tire pressure. 65 PSI Maximum
	5. Check wheel nut torque (and prior to each move). 95 ft-lbs
EVERY 500 HOURS OR 6 MONTHS	1. Change compressor oil and oil filter element.
	2. Clean battery terminals.
	3. Check battery hold-down and cables for wear.
	4. Check engine air filter connections, fittings, and clamps.

# Maintenance

## 8.2 Maintenance Schedule (continued)

INTERVAL	DESCRIPTION
EVERY 500 HOURS OR 6 MONTHS	5. Check radiator hoses and clamps.
	6. Check integrity of engine mounts.
EVERY 1000 HOURS OR 1 YEAR	1. Install new air filter element.
	2. Check all door gaskets, hinges, and latches.
	3. Clean and flush engine cooling system.
	4. Check Emergency Stop button functionality.
	5. Check separator tank pressure relief valve.
	6. Clean cooler fins on all coolers.

### NOTICE

**Compressor oil and oil filter is to be changed after the first 50 hours of operation. After this, normal intervals are to be followed.**

### NOTICE

**Check engine's operator manual for required service and maintenance intervals.**

## 8.3 Recommended Spare Parts List

PART NUMBER	DESCRIPTION
303386	Compressor Oil Filter
308585	Separator Element
308806	Engine Oil Filter
308807	Engine Air Filter Element
308759	SCA20G Shaft Seal Repair Kit

## 8.4 Parts and Service Contact Information

Phone: (800) 433-1382 (Outside USA)  
Email: [nick.luciano@mmdequipment.com](mailto:nick.luciano@mmdequipment.com)  
Website: <http://www.mmdequipment.com>



# Maintenance

## 8.5 Maintenance Log

Accum. Hours	Date	Service Performed	Parts Replaced	Service Work By

# Maintenance

## 8.6 Separator Element Replacement

When the oil vapor in the discharge air becomes excessive, the separator element may need replacing. This should not be necessary more than once a year under normal operating conditions.

### I. Replacement Procedure

- A. Shut down machine and allow to cool for approximately 10 minutes.
- B. Verify entire system pressure is relieved before proceeding.

## **NOTICE**

**When disconnecting hoses, be sure to note the location to ensure there is no confusion when reconnecting.**

- C. Disconnect the 2" hose from the minimum pressure valve.
- D. Disconnect the 5/16" tubes from the regulator valve.
- E. Disconnect the 1/8" tube from the blowdown valve.
- F. Disconnect the 1/4" tube from the oil return line.

## **NOTICE**

**Note the location of the separator tank lid so that it can be reinstalled in the same orientation.**

- G. Remove the ten 5/8" bolts holding the separator tank lid in place.

## **NOTICE**

**The separator tank lid has a pickup tube installed and damaging or moving the tube will affect the machines functionality.**

- H. Lift and remove the lid from the package.
- I. Remove the separator element.

## **! CAUTION**

**Substitute filters may have inadequate working pressure limits, resulting in filter leakage or rupture. Replacement filters must be the same quality and type as the original separator element.**

## **! CAUTION**

**The separator element flange must have a gasket on each side to seal the lid on one side and the vessel on the other. The staple in each gasket acts as a static ground and must not be removed.**

- J. Install a new element.
- K. Reinstall the separator tank lid.
- L. Reinstall the ten 5/8" bolts.
- M. Uniformly tighten the bolts in a crisscross pattern to a torque of 220ft-lb.
- N. Reconnect all hoses and ensure they are correctly located and tightened properly.
- O. Start machine and check for any leaks.

# Maintenance

## 8.7 Engine Air Filter Replacement

- I. Loosen the clamps that secure the engine air filter's rear cover to the filter housing.
- II. Remove and clean the rear cover.
- III. Remove the air filter element.
- IV. Clean the canister with a damp cloth inside and out. DO NOT blow dirt out with compressed air.



**Never blow dirt out of the interior of the filter housing. This may introduce dust downstream of the filter. Instead, use a clean damp cloth.**

- V. Prior to cleaning an element, check the element for damage. Damaged air filter elements must be replaced.
  - A. Place a bright light inside the element to inspect for damages or leaks.
  - B. Inspect all seals and seal contact surfaces on the housing. Should faulty seals be evident, correct the condition immediately.
- VI. If element is undamaged, clean the air filter element.
  - A. The maximum number of times that an element should be cleaned is 2 times; however, the element should be used no longer than a period of 1 year without changing.



**Do not strike the element against any hard surfaces for cleaning as it may possibly rupture the element. Do not oil element.**

- B. When cleaning the element with compressed air, never let the air pressure exceed 30 PSI. Reverse flush the element by directing the compressed air up and down the pleats in the filter media from the inside of the element. Continue reverse flushing until all dust is removed. Should any oil or greasy dirt remain on the filter surface, the element should be replaced.



**When cleaning an element, the element will be damaged if you exceed the recommended maximum air pressure of 30 PSI.**

- C. If the cleaned element is to be stored for later use, it must be stored in a clean container.
- VII. Install the air filter element.
- VIII. Install the rear cover and tighten clamps. Install with rubber evacuator cup down.
- IX. Verify the control panel does not show a filter warning.

# Maintenance

## 8.8 Compressor Oil



**It is important that the compressor oil be of a recommended type, and inspected and replaced as stated in this manual.**



**The combination of a separator element loaded with dirt and oxidized oil products together with increased air velocity as a result of this clogged condition may produce a critical point while the machine is in operation where ignition can take place and could cause a fire in the separator tank.**

The following are general characteristics for a rotary screw lubricant. Due to the impossibility of establishing limits on all physical and chemical properties of lubricants which can affect their performance in the compressor over a broad range of environmental influences, the responsibility for recommending and consistently furnishing a suitable heavy duty lubricant must rest with the individual supplier if they choose not to use the recommended MMD Equipment. rotary screw lubricant. The lubricant supplier's recommendation must, therefore, be based upon not only the following general characteristics, but also upon his own knowledge of the suitability of the recommended lubricant in helical screw type air compressors operating in the particular environment involved.



**Mixing different types or brands of lubricants is not recommended due to the possibility of a dilution of the additives or a reaction between additives of different types.**

### **MMD Equipment Recommended Compressor Lubricant: DEXRON® III ATF**

- I. Specifications
  - 1. Flash point 400°F minimum.
  - 2. Pour point -40°F.
  - 3. Contains rust and corrosion inhibitors.
  - 4. Contains foam suppressors.
  - 5. Contains oxidation stabilizer.



**Due to environmental factors, the useful life of all “extended life” lubricants may be shorter than quoted by the lubricant supplier. MMD Equipment encourages the user to closely monitor the lubricant condition and to participate in an oil analysis program with the supplier.**



**No lubricant, however good and/or expensive, can replace proper maintenance and attention. Select and use it wisely.**

# Maintenance

## 8.8 Compressor Oil (continued)

### II. Adding Compressor Oil

- A. Verify the machine is level to assure oil level in sightglass will be accurate.
- B. Remove any dirt around the separator tank fill cap to prevent contamination from entering the system.



**Do not remove caps, plugs, or other components when the system is running or pressurized. Stop system and relieve all internal pressure before doing so. Failure to comply with this warning will cause damage to property and serious bodily harm.**

- C. Remove the separator tank fill cap.
- D. Inspect and clean the fill cap. Replace if necessary.
- E. Dexron III ATF can then be added until the oil level reaches halfway in the sightglass. Do not over fill the separator tank. This will cause oil carryover in the discharge line and at blowdown.



**Do not replace fill cap with a pipe cap; serious injury or damage could result. Replacement filters must be the same quality and type as the original MMD Equipment fill cap.**

- F. Replace fill cap and tighten immediately.

### III. Changing Compressor Oil

Initially the compressor oil and oil filter should be replaced after the first 50 hours of operation then every 500 hours or 6 months. If the oil appears dirty or has a foul smell, it should be replaced immediately.

- A. Verify the machine is level to assure oil level sightglass will be accurate.
- B. Remove any dirt around the separator tank fill cap to prevent contamination from entering the system.



**Do not remove caps, plugs, or other components when the system is running or pressurized. Stop system and relieve all internal pressure before doing so. Failure to comply with this warning will cause damage to property and serious bodily harm.**

- C. Remove the separator tank fill cap.
- D. Inspect and clean the fill cap. Replace if necessary.
- E. Drain oil from the bottom of the separator tank.
- F. If compressor oil filter change is required, proceed to section 8.10, "Compressor Oil Filter".

# Maintenance

## 8.8 Compressor Oil (continued)

### III. Changing Compressor Oil (continued)

- G. Dexron III ATF can now be added until the oil level reaches halfway in the sightglass. Do not over fill the separator tank. This will cause oil carryover in the discharge line and at blowdown.



**Do not replace fill cap with a pipe cap; serious injury or damage could result. Replacement filters must be the same quality and type as the original MMD Equipment fill cap.**

- H. Replace fill cap and tighten immediately.
- I. Run system briefly to see if more oil needs to be added and to ensure there are no leaks.

## 8.9 Compressor Oil Cooler

Any sign of leakage from the compressor oil cooler justifies a pressure test to assure its integrity. Cooler leaks should only be repaired by qualified service technicians. Dirt that clogs the cooling fins of the cooler should be removed. The use of an air stream or high-pressure steam cleaner should be done with caution so as to not damage the delicate fins. Bent cooling fins will reduce the cooling capability of the compressor oil cooler.

## 8.10 Compressor Oil Filter

Initially the filter should be replaced after the first 50 hours of operation, then every 500 hours or 6 months. A dirty filter can restrict oil flow, causing high oil temperature, which will result in a system shutdown.

### I. Compressor Oil Filter Replacement

- A. Verify the compressor oil system is drained.
- B. Using a strap wrench, remove the oil filter and o-ring.
- C. Clean o-ring seating surface on the oil filter head.



**Substitute filters may have inadequate working pressure limits, resulting in filter leakage or rupture. Replacement filters must be the same quality and type as the original oil filter.**

- D. Apply a light film of oil to the new o-ring.
- E. Hand tighten new filter until o-ring is seated in o-ring groove.



**Mechanical overtightening may distort the threads or damage the filter element seal.**

- F. Continue tightening filter by hand an additional 1/2 to 3/4 turn.
- G. Continue with Changing the Compressor Oil steps.

# Maintenance

## 8.11 Engine Cooling System Maintenance

The LR 450's engine has a pressurized cooling system that contains a 50/50 mixture of water and ethylene glycol. Maintenance of the system includes the engine coolant, belt tension, fan integrity, and radiator. Further cooling system maintenance is defined in the engine manual.

### I. Engine Coolant

#### A. Specifications

This diesel engine requires a balanced coolant mixture of water and ethylene glycol base antifreeze. This protects the engine cooling system from corrosion as well as freezing damage. The LR 450 is shipped from the factory with a 50/50 mixture of water and ethylene glycol. In tropical climates where freeze protection is not required, glycol engine coolant should still be used to help prevent corrosion and pitting of cylinder liners.

#### B. Mixtures

Antifreeze concentration level should not exceed recommended levels. To do so can cause cooling system failure.

1. A mixture of 50% antifreeze and 50% water is required for temperatures above -34° F.
2. A mixture of 60% antifreeze and 40% water is required for temperatures below -34° F.  
This provides protection to -65° F.
3. Never exceed a 60% overall antifreeze mix.

#### C. Coolant Level

Before each start-up, when radiator is cold, the coolant level should be checked. When needed, refill with a 50/50 solution of water and ethylene glycol, DO NOT use 100% anti-freeze. The proper level for coolant in the system is to the bottom of the radiator fill neck and to the cold line of the recovery bottle.



**Check the coolant level only when the engine is stopped and the temperature is below 160° F. Failure to do so can cause personal injury from heated coolant spray.**

### II. Engine Radiator

#### A. Radiator Core

Any sign of leakage from the engine radiator may justify a pressure test to assure its integrity. Radiator leaks should only be repaired by qualified service technicians. Dirt that clogs the cooling fins of the radiator should be removed. The use of an air stream or high-pressure steam cleaner should be done with caution so as to not damage the delicate fins. Bent cooling fins will reduce the cooling capability of the radiator.

# Maintenance

## 8.11 Engine Cooling System Maintenance (continued)

### II. Engine Radiator (continued)

#### B. Radiator Pressure Cap

If coolant continually spills from radiator through the overflow, the radiator cap should be tested and/or replaced with a 13 PSI rated cap. Be sure cap is tightened to the proper secure position.

### III. Engine Fan

Check the engine fan for cracks, loose bolts, and bent or damaged blades. Replace damaged fans immediately. Do not run system if any of the conditions exist. Make sure the hex head bolts mounting the fan to the water pump pulley are properly torqued to 29 ft-lbs.



**Never use the fan to rotate the engine. The blade(s) can be damaged causing a fan failure, which can result in personal injury or property damage.**

### IV. Engine V-Belt

Visually inspect the engine v-belt. Replace belt if cracked or frayed. Check engine manual for proper belt tension.

## 8.12 Battery

The battery supplied with the LR 450 has been selected to have ample cold cranking amperes for quick starts in cold weather. Keep the battery fully charged and if replacement is necessary the new battery must be of equal or greater capacity.



**Battery gas can explode causing acid burn to skin and blindness. Do not overcharge or jump the battery incorrectly.**



# Troubleshooting

## 9.1 Troubleshooting Chart

Problem	Cause	Remedy
Unexpected Shutdown	No fuel, low fuel, or contaminated fuel	Check fuel supply
	Safety shutdown occurred	Check control panel for cause
Unable to obtain proper engine speed	Improper engine timing	Adjust engine timing
	Clogged engine air filter	Clean or replace immediately
Excessive Vibration	Damaged or loose motor mount	Repair or replace
	Low engine speed	Verify engine speed minimum of 1800 RPM
	Bent fan blade	Repair or replace immediately
Machine will not build up pressure	Blowdown valve open	Check pressure relief valve for leaks; replace as needed
	Faulty drive coupling	Replace coupling
	Compressor undersized for air requirement	Verify maximum air requirement
Insufficient air delivery	Low engine speed	Check engine speed/adjust if necessary
	Blowdown valve open	Clean or replace immediately
	Leaks in air system	Check all air lines, fittings, and connections for leaks; repair as necessary
	Faulty inlet valve	Repair or replace immediately
	Faulty drive coupling	Repair or replace coupling
Excessive compressor oil consumption	Separator tank overfilled	Drain oil to proper level
	Leak in compressor oil system	Check all piping lines and connections; repair as necessary
	Oil return line not removing oil from separator element	Check return line depth and connections; repair as necessary
	Separator element damaged	Replace element

# Troubleshooting

## 9.1 Troubleshooting Chart (continued)

Problem	Cause	Remedy
Compressor overheating	Unit operating in area with limited fresh air	Reposition unit or open up confinement
	Fan belts are loose or broken	Tighten or replace
	Dirt build-up on oil cooler fins	Clean oil cooler thoroughly; be careful not to damage fins
	Compressor oil level low	Check and fill to proper level
	Compressor oil filter dirty	Replace filter
	Thermal valve malfunctioning	Repair or replace valve
	Restriction in compressor oil lines	Clean or replace lines
	Oil cooler internally restricted	Clean internal tubes of cooler
Engine overheating	Unit operating in area with limited fresh air	Reposition unit or open up confinement
	Fan belts are loose or broken	Tighten or replace
	Dirt build-up on radiator fins	Clean radiator thoroughly; be careful not to damage fins
	Thermostat not opening	Replace thermostat
	Radiator internally restricted	Clean and flush radiator
	Faulty or incorrect radiator cap	Check cap/replace as required
	Faulty water pump	Repair or replace pump
	Coolant level low	Add coolant to proper level

## 9.2 Parts and Service Contact Information

Phone: (800) 433-1382 (Outside USA)  
 Email: [nick.luciano@mmdequipment.com](mailto:nick.luciano@mmdequipment.com)  
 Website: <http://www.mmdequipment.com>

**NOTICE**

When calling for technical support, please have machine serial number and this manual available.

# Warranty

## 10.1 Warranty

# **CONTACT MMD EQUIPMENT FOR WARRANTY!**

Phone: (800) 433-1382 (Outside USA)  
Email: [nick.luciano@mmdequipment.com](mailto:nick.luciano@mmdequipment.com)  
Website: [www.mmdequipment.com](http://www.mmdequipment.com)

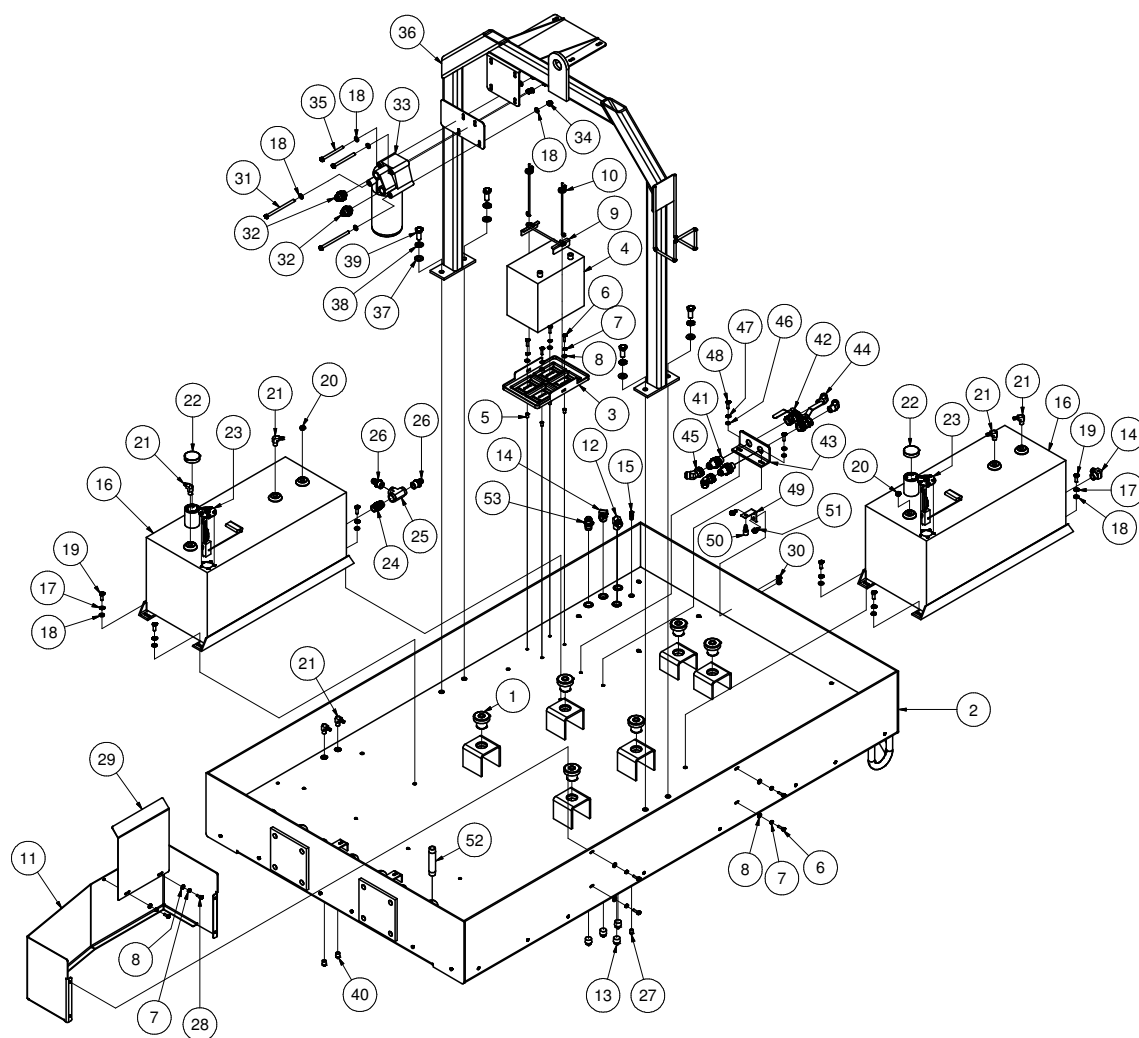
# Parts and Illustration Section

## 11.1 Frame System

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	6	302764	ISOLATOR
2	1	308577	FRAME
3	1	120-66020	TRAY
4	1	308731	BATTERY
5	4	120-36992	INSERT
6	8	929104-100	BOLT
7	10	938004-062	WASHER
8	10	938604-071	WASHER
9	1	120-14966	BRACKET
10	2	120-26804	BOLT
11	1	308579	TRAY
12	1	960212-075	ELBOW
13	4	900000-030	PLUG
14	2	970312-075	ELBOW
15	1	960204-025	ELBOW
16	2	308592	TANK
17	8	937806-094	WASHER
18	16	938206-071	WASHER
19	8	929806-100	BOLT
20	2	902915-015	PLUG
21	6	970306-038	ELBOW
22	2	307179	CAP
23	2	302382-MOD	SENDER
24	1	960412-075	NIPPLE
25	1	960612-075	TEE
26	2	974812-075	CONNECTOR
27	1	900000-010	PLUG
28	2	929104-075	BOLT
29	1	308595	GUARD
30	2	925305-283	NUT
31	2	929806-600	BOLT
32	2	970712-075	CONNECTOR
33	1	80216	KIT
34	4	925506-198	NUT
35	2	929806-450	BOLT
36	1	308597	LIFTBAIL
37	4	938210-112	WASHER
38	4	937810-156	WASHER
39	4	929810-150	BOLT
40	2	900000-015	PLUG
41	2	304643	BULKHEAD
42	2	301922-075	VALVE
43	1	308630	BRACKET
44	2	960012-075	ELBOW
45	2	989712-075	ELBOW
46	2	938605-071	WASHER
47	2	938005-078	WASHER
48	2	929105-100	BOLT
49	1	308637	BRACKET
50	1	308638	SWITCH
51	2	929705-075	BOLT
52	1	922112-050	NIPPLE
53	1	960112-075	CONNECTOR

# Parts and Illustration Section

## 11.1 Frame System (continued)



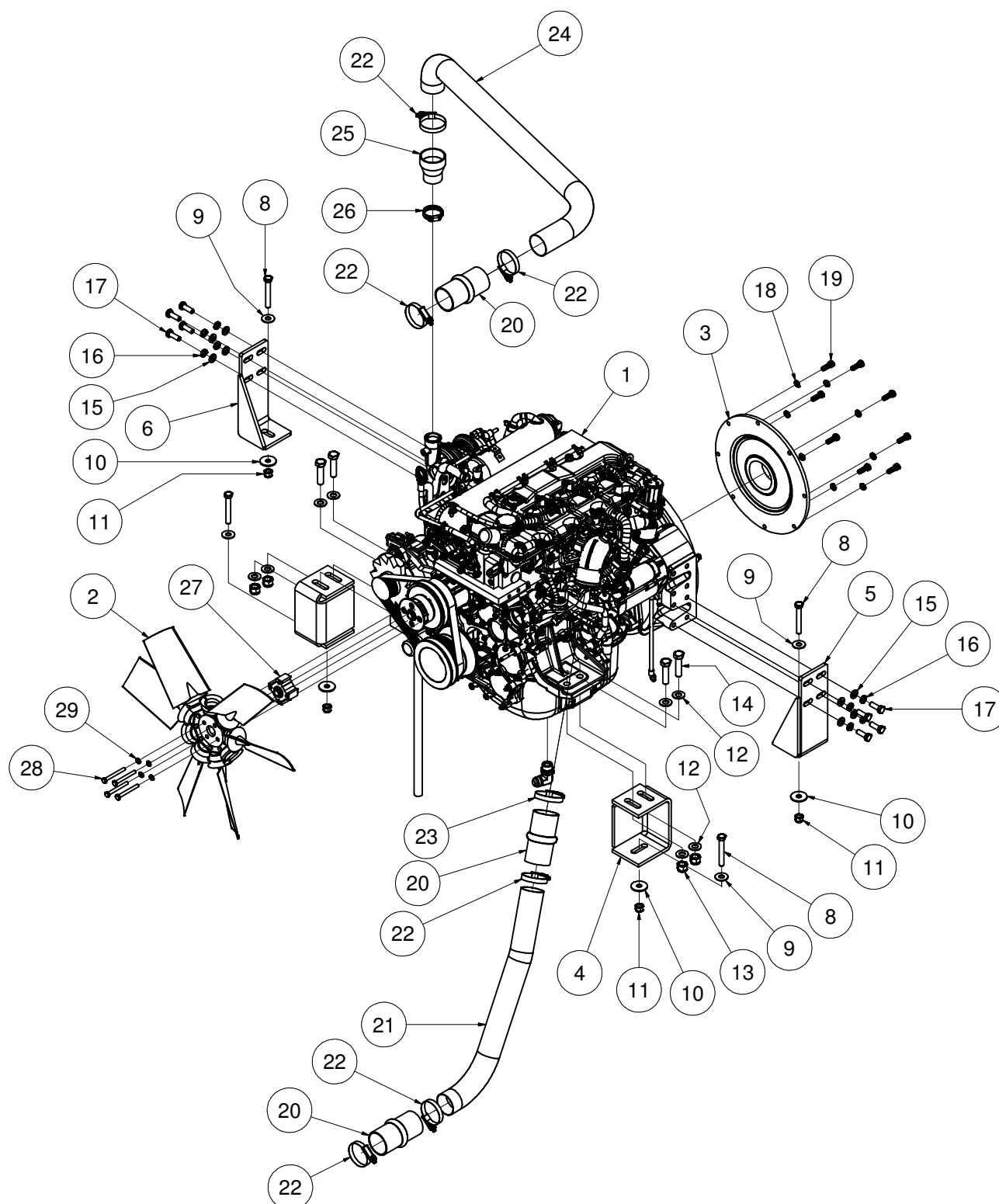
# Parts and Illustration Section

## 11.2 Engine System

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	308457	ENGINE
2	1	308529	FAN
3	1	303340	COUPLING
4	2	308580	BRACKET
5	1	308581	BRACKET
6	1	308582	BRACKET
7	1	970412-106	ELBOW
8	4	929808-350	BOLT
9	4	938208-112	WASHER
10	4	120-16832	WASHER
11	4	925508-262	NUT
12	8	938210-112	WASHER
13	4	925510-329	NUT
14	4	929810-250	BOLT
15	8	938912-200	WASHER
16	8	938812-250	WASHER
17	8	929212-350	BOLT
18	8	938810-220	WASHER
19	8	929210-300	BOLT
20	3	308631	CONNECTOR
21	1	308674	TUBE
22	6	303589	CLAMP
23	1	303588	CLAMP
24	1	308673	TUBE
25	1	308635	ADAPTER
26	1	308634	CLAMP
27	1	308738	SPACER
28	4	929208-750	BOLT
29	4	938808-200	WASHER

# Parts and Illustration Section

## 11.2 Engine System (continued)



# Parts and Illustration Section

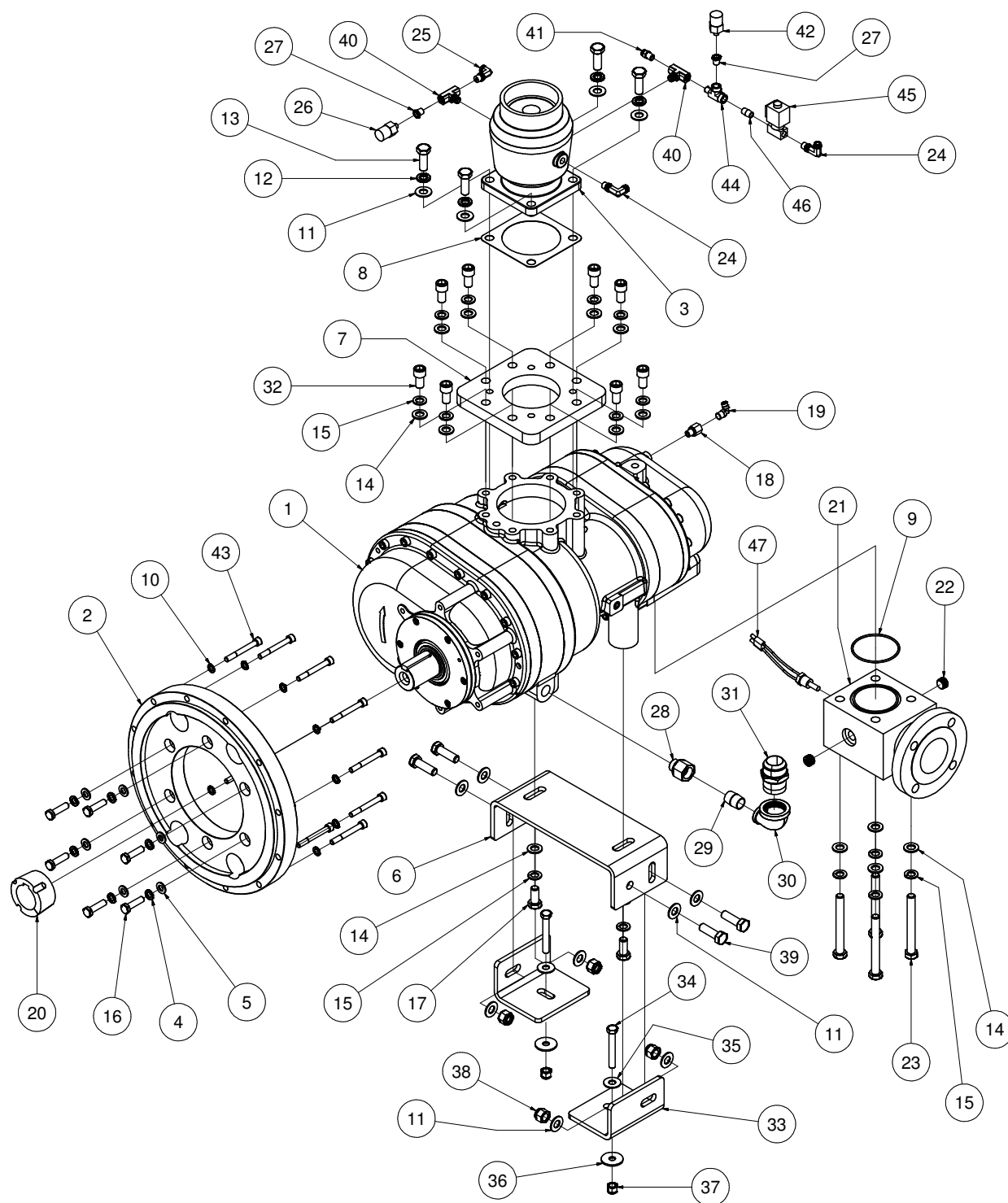
## 11.3 Compressor System

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	308446-120	AIREND
2	1	308552	ADAPTER
3	1	303983	VALVE
4	6	938812-250	WASHER
5	6	938912-200	WASHER
6	1	308583	BRACKET
7	1	308584	ADAPTER
8	1	126-64754	GASKET
9	1	926102-240	O-RING
10	10	938810-220	WASHER
11	12	938210-112	WASHER
12	4	937810-156	WASHER
13	4	929810-175	BOLT
14	14	938916-225	WASHER
15	14	938816-350	WASHER
16	6	929212-450	BOLT
17	2	929216-350	BOLT
18	1	970804-025	ADAPTER
19	1	304720	VALVE
20	1	303341	BUSHING
21	1	308591	FLANGE
22	2	902915-020	PLUG
23	4	929216-140	BOLT
24	2	987305-025	ELBOW
25	1	987302-025	ELBOW
26	1	301421	SWITCH
27	2	907600-005	BUSHING
28	1	970812-075	ADAPTER
29	1	922212-000	NIPPLE
30	1	901606-030	ELBOW
31	1	960124-150	CONNECTOR
32	8	929316-300	BOLT
33	2	308623	BRACKET
34	2	929808-350	BOLT
35	2	938208-112	WASHER
36	2	120-16832	WASHER
37	2	925508-262	NUT
38	4	925510-329	NUT
39	4	929810-200	BOLT
40	2	961904-025	TEE
41	1	987205-025	CONNECTOR
42	1	301422	SWITCH
43	10	929310-850	BOLT
44	1	964804-025	TEE
45	1	307682	VALVE
46	1	922204-000	NIPPLE
47	1	301040-001	SWITCH



# Parts and Illustration Section

## 11.3 Compressor System (continued)



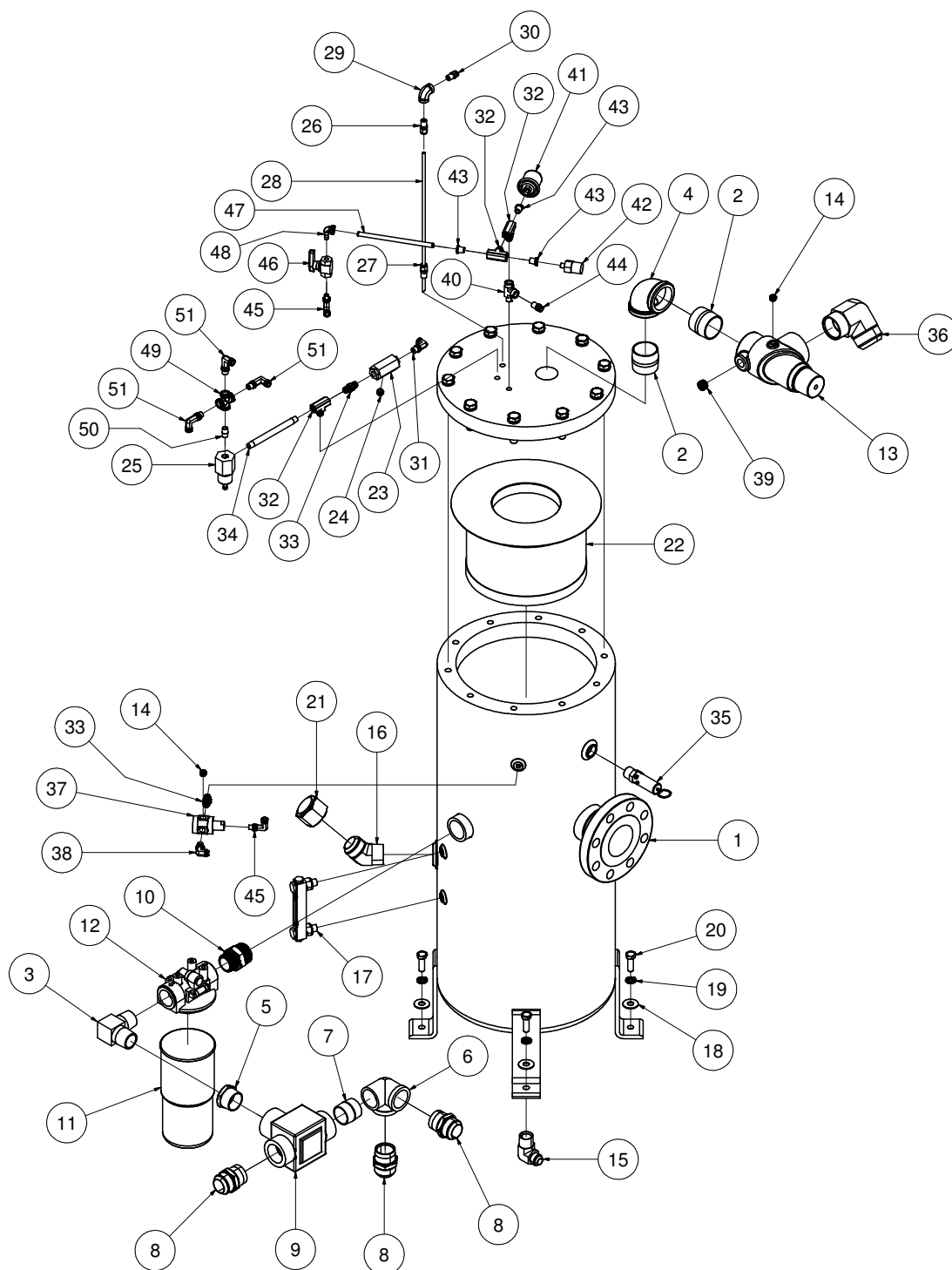
# Parts and Illustration Section

## 11.4 Discharge System

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	308490	TANK
2	2	922132-000	NIPPLE
3	1	984116-125	ELBOW
4	1	901515-080	ELBOW
5	1	907606-050	BUSHING
6	1	902615-060	ELBOW
7	1	922224-000	NIPPLE
8	3	960124-150	CONNECTOR
9	1	303387	THERMOSTAT
10	1	961624-125	NIPPLE
11	1	303386	FILTER
12	1	303385	HEAD
13	1	303379	VALVE
14	2	902915-010	PLUG
15	1	960212-100	ELBOW
16	1	960024-150	ELBOW
17	1	120-63815	SIGHT GLASS
18	4	938208-112	WASHER
19	4	937808-125	WASHER
20	4	929808-150	BOLT
21	1	301466-150	CAP
22	1	308585	ELEMENT
23	1	301827	VALVE
24	1	902915-010M	PLUG
25	1	300057	VALVE
26	1	987504-025	CONNECTOR
27	1	987504-025M	CONNECTOR
28	1	304210	TUBE
29	1	977604-025	ELBOW
30	1	987204-025	CONNECTOR
31	1	987302-025	ELBOW
32	3	961904-025	TEE
33	2	960404-025	NIPPLE
34	1	922104-060	NIPPLE
35	1	303668	VALVE
36	1	960232-200	ELBOW
37	1	304004	VALVE
38	1	987304-025	ELBOW
39	1	902915-020	PLUG
40	1	964804-025	TEE
41	1	308461	SENDER
42	1	308721	SWITCH
43	3	907600-005	BUSHING
44	1	987205-025	CONNECTOR
45	2	987305-012	ELBOW
46	1	125-16672	VALVE
47	1	922202-070	NIPPLE
48	1	901115-005	ELBOW
49	1	901315-010	CROSS
50	1	922204-000	NIPPLE
51	3	987305-025	ELBOW

# Parts and Illustration Section

## 11.4 Discharge System (continued)



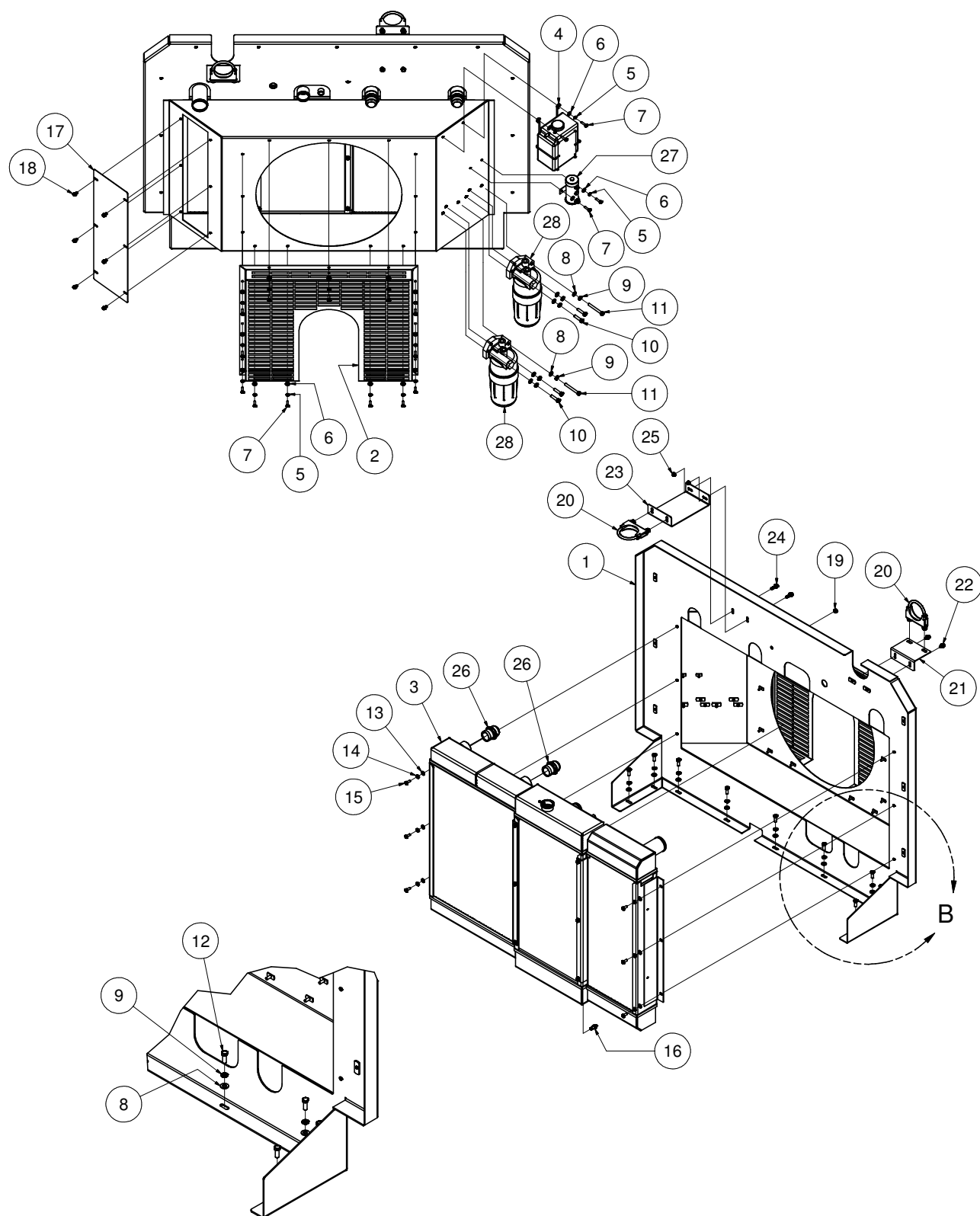
# Parts and Illustration Section

## 11.5 Cooler System

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	308578	BULKHEAD
2	1	308619	GUARD
3	1	308512	COOLER ASSY
4	1	150-90199	TANK
5	17	938004-062	WASHER
6	17	938604-071	WASHER
7	17	929104-100	BOLT
8	15	938206-071	WASHER
9	15	937806-094	WASHER
10	4	929806-150	BOLT
11	2	929806-300	BOLT
12	9	929806-100	BOLT
13	6	938605-071	WASHER
14	6	938005-078	WASHER
15	6	929105-075	BOLT
16	1	960104-025	CONNECTOR
17	1	308617	PANEL
18	6	929704-050	BOLT
19	1	308618	GROMMET
20	2	980100-300	CLAMP
21	1	308615	BRACKET
22	2	929705-050	BOLT
23	1	308616	BRACKET
24	2	929705-100	BOLT
25	2	925305-283	NUT
26	2	960124-150	CONNECTOR
27	1	308457-36	ENGINE
28	2	308457-35	ENGINE

# Parts and Illustration Section

## 11.5 Cooler System (continued)



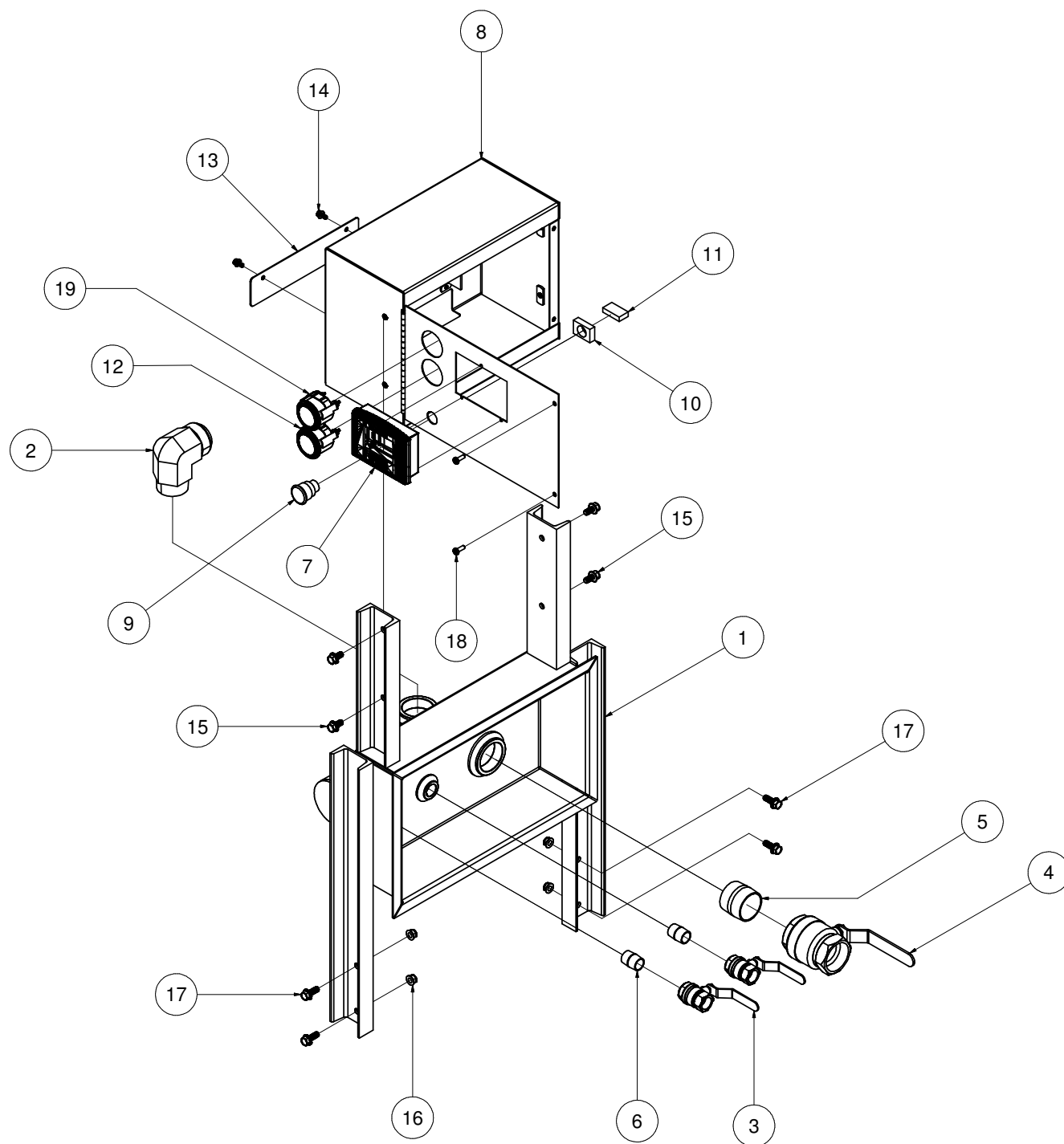
# Parts and Illustration Section

## 11.6 Electrical System

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	308675	ASSY
2	1	960232-200	ELBOW
3	2	300022-075	VALVE
4	1	300022-200	VALVE
5	1	922132-000	NIPPLE
6	2	922212-000	NIPPLE
7	1	308644	CONTROLLER
8	1	308663	BOX
9	1	308669	BUTTON
10	1	308670	ADAPTER
11	1	308671	SWITCH
12	1	308460	GAUGE
13	1	308672	PLATE
14	2	929704-050	BOLT
15	4	929706-075	BOLT
16	4	925306-347	NUT
17	4	929706-100	BOLT
18	2	981504-075	SCREW
19	1	308693	GAUGE
NS	1	308721	SWITCH
NS	1	301040-001	SWITCH
NS	1	308661	VALVE
NS	1	308662	CONNECTOR
NS	1	308725	CABLE
NS	1	308753	CABLE
NS	1	308752	HARNESS

# Parts and Illustration Section

## 11.6 Electrical System (continued)



# Parts and Illustration Section

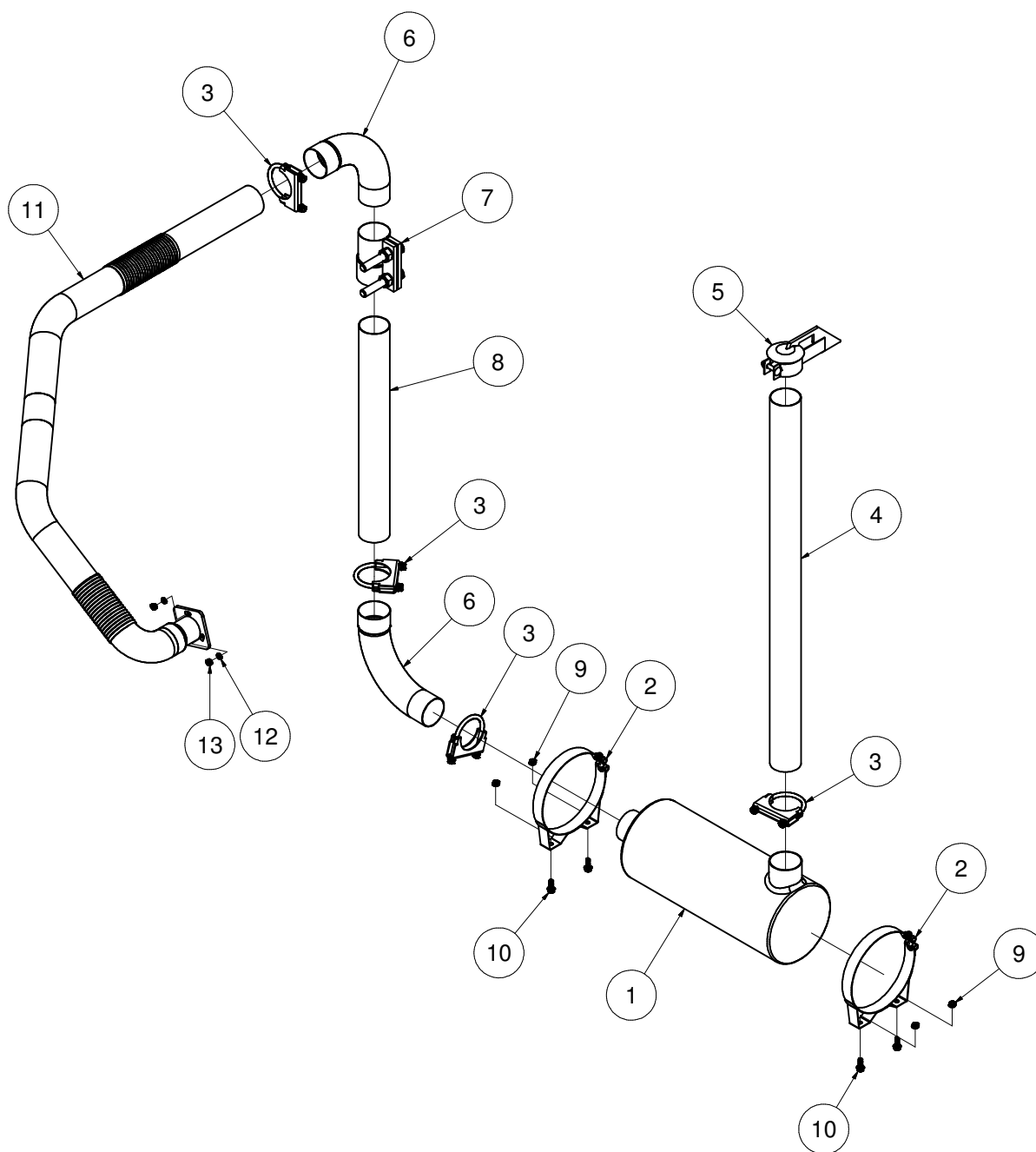
## 11.7 Exhaust System

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	304067	MUFFLER
2	2	304071	BAND
3	4	980100-300	CLAMP
4	1	308576	PIPE
5	1	150-90915	CAP
6	2	300915-300	ELBOW
7	1	300639-300	CLAMP
8	1	308626	PIPE
9	4	925305-283	NUT
10	4	929705-100	BOLT
11	1	40037	ASSY
12	3	938808-200	WASHER
13	3	925908-125	NUT
NS	1	300033-450	CLAMP
NS	1	303381	BLANKET



# Parts and Illustration Section

## 11.7 Exhaust System (continued)



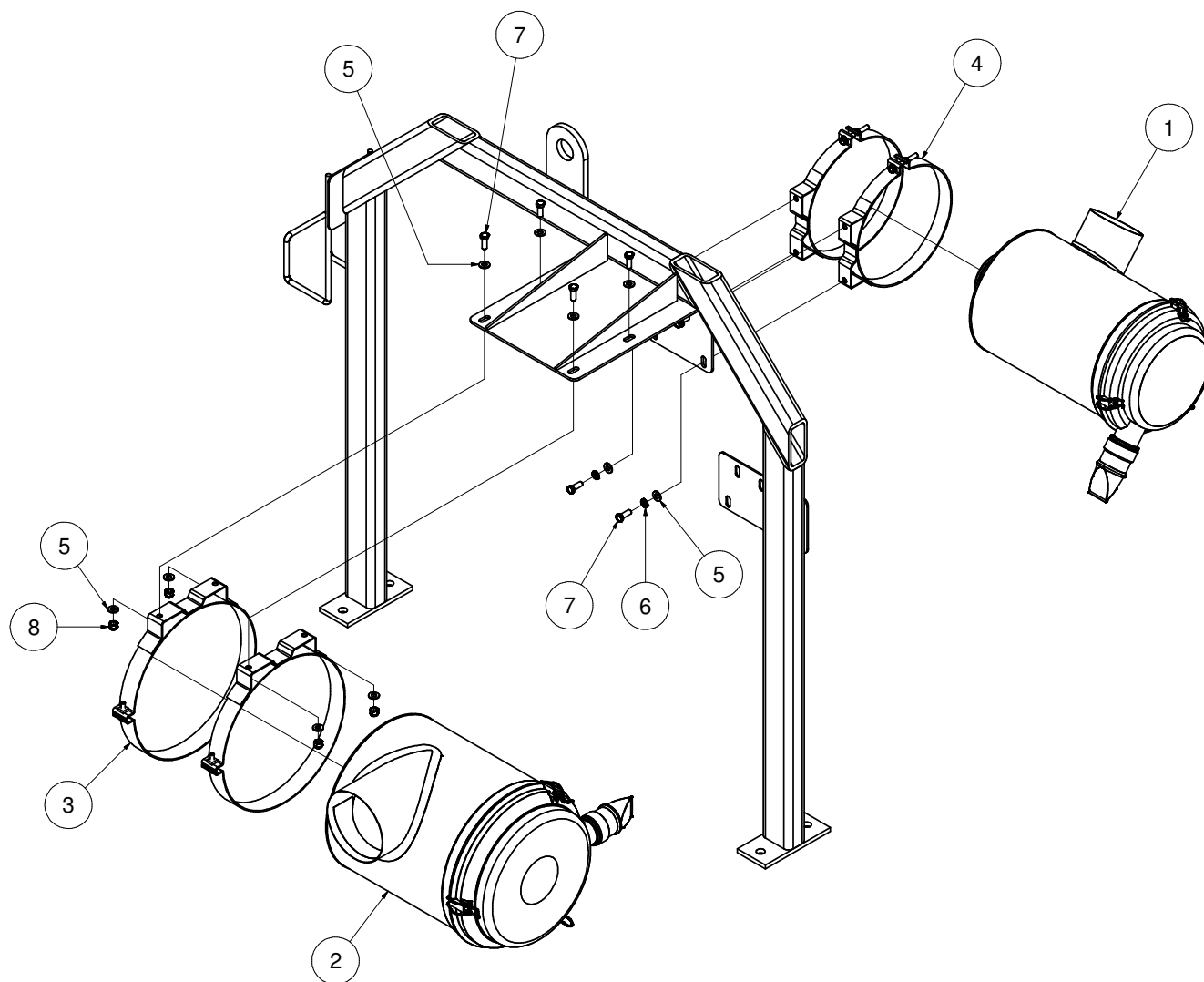
# Parts and Illustration Section

## 11.8 Air Filter System

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	308563	ASSY
2	1	308564	ASSY
3	2	308565	BAND
4	2	300067	BAND
5	12	938206-071	WASHER
6	4	937806-094	WASHER
7	8	929806-100	BOLT
8	4	925506-198	NUT

# Parts and Illustration Section

## 11.8 Air Filter System (continued)



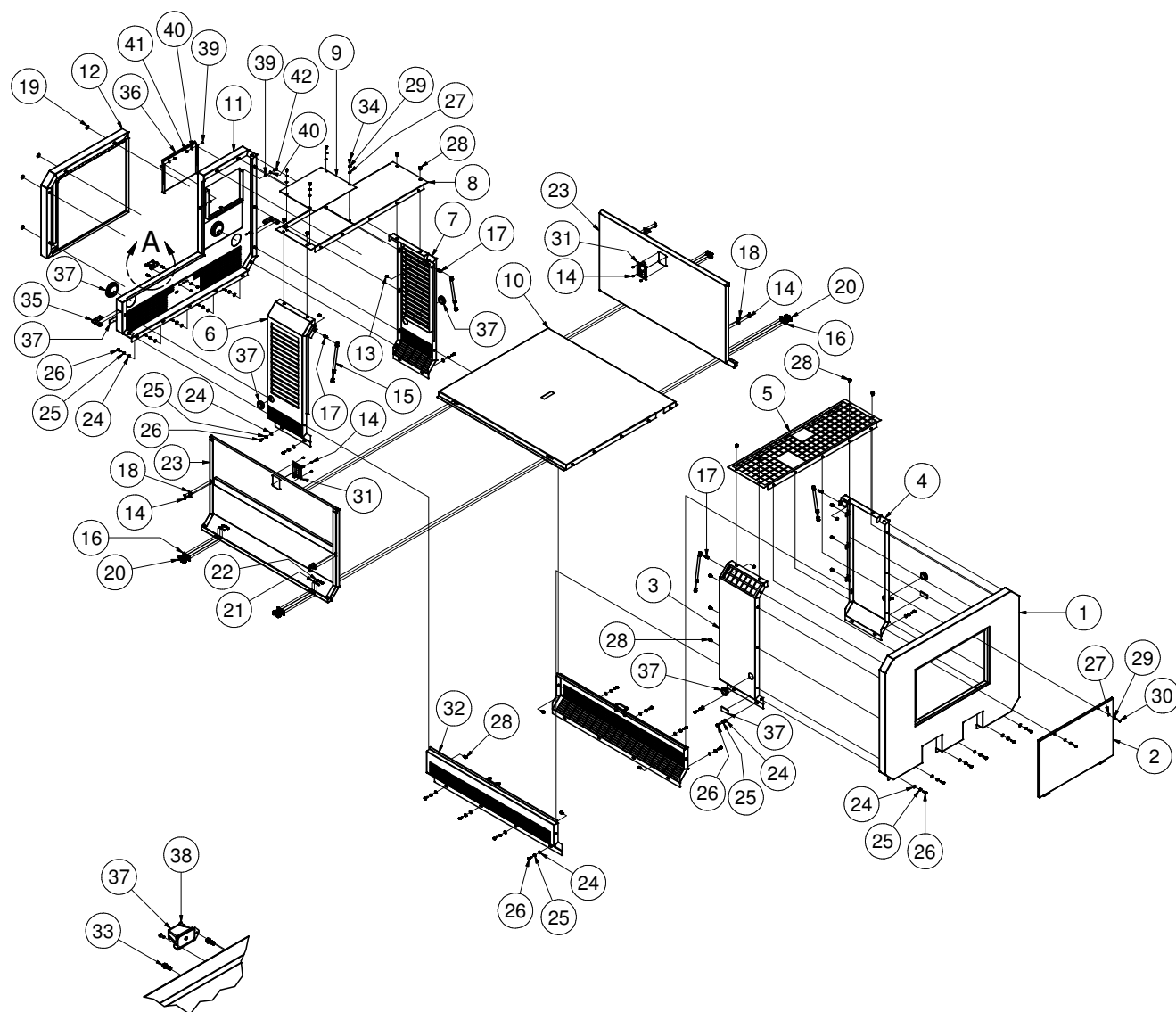
# Parts and Illustration Section

## 11.9 Canopy System

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	308598	PANEL
2	1	308599	DOOR
3	1	308600	PANEL
4	1	308601	PANEL
5	1	308602	PANEL
6	1	308604	PANEL
7	1	308605	PANEL
8	1	308606	PANEL
9	1	308607	COVER
10	1	308608	PANEL
11	1	308610	PANEL
12	1	308611	PANEL
13	4	924305-166	NUT
14	20	943103-025	RIVET
15	4	305137	SPRING
16	4	308588	HINGE
17	4	308612	STUD
18	4	303229	BRACKET
19	4	308613	PLUG
20	24	990702-075	SCREW
21	24	938602-049	WASHER
22	26	924302-130	NUT
23	2	308609	DOOR
24	27	984006-071	WASHER
25	27	990906-094	WASHER
26	27	990806-100	BOLT
27	6	984004-071	WASHER
28	56	991005-075	BOLT
29	6	990904-062	WASHER
30	2	990804-150	BOLT
31	2	308627	LATCH
32	2	308603	PANEL
33	2	991004-075	BOLT
34	4	990804-075	BOLT
35	2	308625	BUMPER
36	1	308651	DOOR
37	1	80215	KIT
38	2	991102-050	SCREW
39	4	977004-062	WASHER
40	4	938604-071	WASHER
41	2	924304-145	NUT
42	2	929104-100	BOLT
NS	1	80221	KIT

# Parts and Illustration Section

## 11.9 Canopy System (continued)



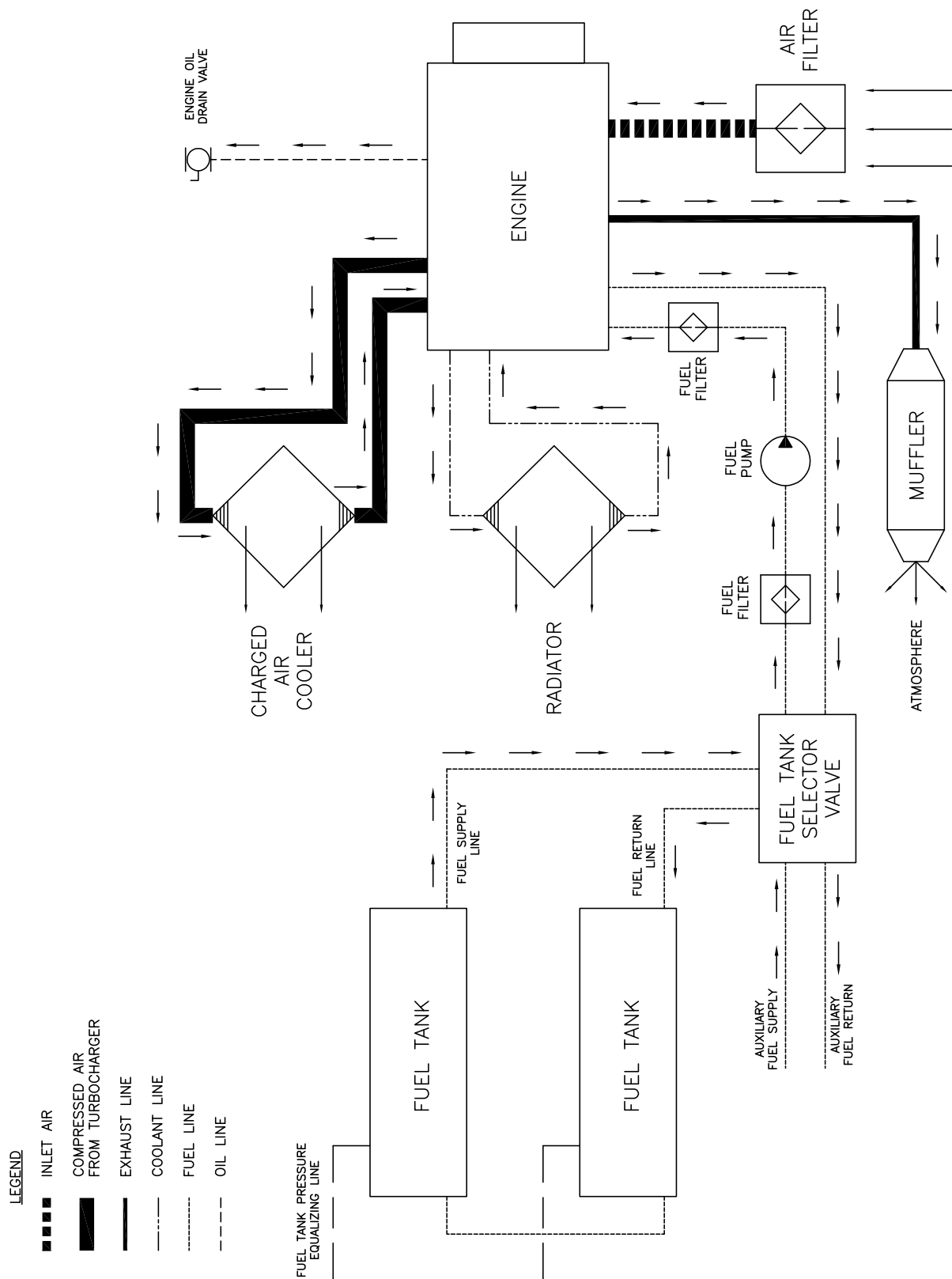
# Parts and Illustration Section

## 11.10 Hose System

Parts List		
QTY	PART NUMBER	DESCRIPTION
4	925510-329	NUT
4	929810-300	BOLT
8	929812-350	BOLT
1	303445	GASKET
8	925512-382	NUT
1	308648	HOSE ASSY
1	308658	GASKET
2	301786-500	CLAMP
2	301786-400	CLAMP
2	301785-500	HOSE
3	301785-400	HOSE
1	308740	HOSE ASSY
6	304785-075	FITTING
2	304785-025	FITTING
8.583 FT	304783-025	HOSE
9.333 FT	304783-075	HOSE
11.5 FT	304783-150	HOSE
4	304785-150	FITTING
1	120-90624	HOSE
1	301397	INSERT
1	120-90728	ELBOW
1	300033-250	CLAMP
1	300033-400	CLAMP
2	120-11563	CLAMP

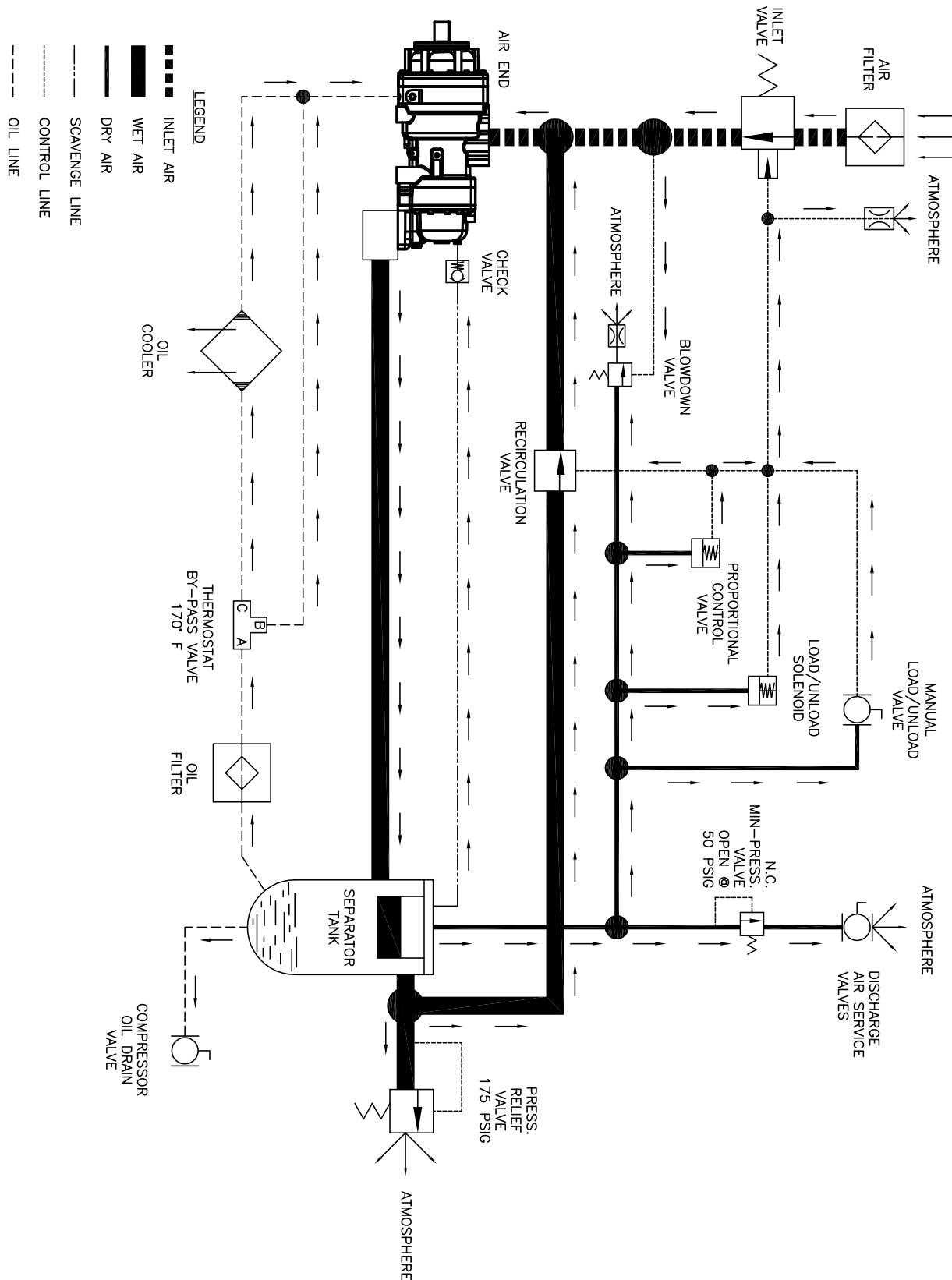
# Parts and Illustration Section

## 11.11 Engine Air/Oil Schematic



# Parts and Illustration Section

## 11.12 Airend Air/Oil Schematic





### 11.13 System Wiring Diagram

